Carbon capture is the only way to burn fossil fuels without damaging the environment and our future will depend on it. The technology is here but has not really begun to be implemented.

## What is it

It means collecting carbon dioxide gas from coal, oil or gas-fired power stations, and storing it permanently underground (sequestration). It is the most important way to reduce carbon emissions in electricity production, is available now and could be scaled up very rapidly.

## How it works

There are several ways of collecting and storing carbon dioxide. Chimney exhaust is a mix of carbon dioxide, nitrogen, nitrogen dioxide , steam and other gases.
A simple way to capture 100% of all carbon dioxide is to use some of the electricity from the power station to separate oxygen from air and to use the oxygen, rather than air, to burn fuel. That means that almost all the waste gas is pure carbon dioxide and steam.
As the gas cools, steam condenses to water, allowing the carbon dioxide to be piped safely underground.

An alternative method is to separate the gases after burning in air, using an absorber plus a solvent which captures almost 90% of carbon dioxide. The solvent is then heated to 120 degrees centigrade which releases the gas for later storage. The other components of the flue gases are then discharged into the atmosphere along with the remaining carbon dioxide.

The most convenient way to store carbon dioxide is to pipe it back into an oil or gas field, under huge pressure, which also means the gas becomes liquid. As a result, pressure rises in the underground store, which can help with recovery of the remaining oil or gas.
A far more controversial storage method is to release carbon dioxide into very deep ocean water where (it is hoped) it is absorbed and will stay for a long time.
A safer method using water to store carbon is to pump carbon dioxide into huge natural reservoirs of salty water deep in ancient rock formations (saline aquifers).
An alternative is to pump the gas back into old coal seams which have been mined.
Once again there are potential problems of leakage, but intact coal seams have contained gas reliably for millions of years.

Opportunities for storage are huge. The UN's International Energy Agency estimates that Canada alone has sites which could store up to 1,300 billion tonnes of CO2.
That would be enough to last Canada over a hundred years, by which time other kinds of energy generation will be used.

Carbon sequestration is a practical way for energy companies to reduce carbon emissions by 50%.

## Why it matters

Most electricity in the world is made by burning fossil fuels. The scale of carbon burning is immense. A single large power station complex such as the ageing Nanticoke plant in Ontario or Sundance in Alberta can burn through 250 railway trucks of coal a day.

100% carbon capture means that we can carry on burning oil, coal and gas with zero emissions. The world will need several decades for complete transition from burning carbon in power stations, and carbon capture provides an immediate solution.
In addition, carbon capture can be fitted to many old power stations.

## Challenges

We need to be certain that the carbon dioxide will stay underground. We know that natural gas has been safely locked away in the same geological conditions for millions of years but it is impossible to rule out slow leakage through faults in the rock formations.
These would be very hard to detect if gradual.
There is also a small risk of a “blowout” if the seal on the end of the pipe used to pump waste gas into the field became damaged. Another challenge is that only a few power stations in the world are close enough to oil and gas fields to make such storage economic.

So far only three successful projects are running with a combined storage of three million tons a year of CO2 – but America’s electricity industry alone produces 1.5 billion tons a year which would mean finding another 1,500 sites.

## Business opportunities

The EU has recommended that at least 12 large-scale demonstration projects are launched by 2015 for coal and gas-fired power plants, and that by 2020 all new coal-fired plants should include carbon-capture and storage (CCS) technology. Existing plants are to be 'retrofitted'. These will be paid for by increasing electricity generation prices by 1-2 pence per kilowatt.

The Bush administration announced a clean coal strategy for America which was intended to be in force by 2012.

The cost of capturing a ton of carbon dioxide is currently around £20-45 a ton but this is expected to fall to around £12. Vattenfall, Shell, RWE and Statoil are already developing carbon capture commercially.

Norway's national oil company is removing a million tons a year of CO2 from North Sea natural gas, and re-injecting it back into empty wells. BP is doing the same with an oil well in Algeria and is developing a similar project in California.

A coal-gasification plant in Beulah, North Dakota, is pumping 1.5 million tons of CO2 a year over 200 kilometres by pipeline to Weyburn, Sask, where it is re-injected into an old oil field to help recover new deposits. Each of these projects will remove the same amount of carbon over 20 years that would be used in 12 months by 5 million vehicles.

The size of the carbon market over the next 20 years could be greater than $500 billion – a single carbon capture and storage installation at a large plant can cost up to $1 billion to build.

Many more Global Warming Videos by Futurist Dr Patrick Dixon and Sustainagility book.

## Articles and Videos on Global Warming

Here are more resources on this site that you may find helpful.