



# CAN YOU Believe it?

WITH ASSOCIATE PROFESSOR DEREK LEINWEBER

## Carbon fading

The world needs to drive a wedge into greenhouse emissions.

SCIENCE knows the cause of global warming. It's carbon. The world's coal, oil and natural gas industries dump about seven billion tons of carbon into the atmosphere every year. It follows that to fix the problem, one needs to remove carbon from the world's energy production. If only it were so simple.

Despite the evolution of more efficient refrigerators, airconditioners, motors and aircraft engines, the rate of worldwide carbon production continues to increase steadily. Year after year, carbon emissions grow in an almost linear fashion.

With a link between carbon production and climate change already established, there are great concerns about a continued increase in carbon emissions. Scientists are calling for an end to this steady increase. They are calling on business and government to take action to prevent any increase beyond the present rate of carbon emissions. A reduction in carbon emissions is left for the future.

It is important to emphasise that these actions must be new initiatives beyond the normal rate of technological advancement. The point is that our present rate of technological improvement is not enough to stop the steady increase in carbon emissions year after year. The problem is huge and daunting. One should be concerned whether progress on this issue will be sufficiently rapid to escape major disasters along the way.

To help put the problem into a manageable perspective, scientists have carved up the present linear growth in the rate of carbon emissions over the present-day rate into seven carbon "wedges". The idea is that a policy change now will have only a small effect at first, but over time as the policy is implemented and enforced for all new developments the benefits will grow, producing a wedge.

So how hard is it to implement a new policy that will produce one of the required seven wedges? It's hard, because you cannot rely on the natural development of improved technology. Again, the point is that despite a steady stream of technological advances, the rate of carbon emissions continues to increase every year. For example, if cars have become increasingly fuel efficient during the past 20 years, then it would be inappropriate to count a continuation of this as part of a wedge in the future. This technology has already been accounted for in the current emissions rate and it continues to grow.

Many people look to green energy alone for the solution. While green alternatives must be exploited, this approach alone is insufficient.

Today's green-energy production (solar, wind, geothermal, etc.) provides a mere 2 per cent of the world's energy production.

### Seven ways to clean up

- Cut car emissions by either increasing the fuel economy of two billion cars from 9 litres per 100km to 4.5 litres per 100km or driving two billion cars only 8000km a year instead of 16,000km.
- Stop all deforestation world wide.
- Replace 1400 large coal-fired power plants with natural gas-fired plants.
- Install carbon-capture "clean coal" technology at 2400 coal-fired power plants with an efficiency of 30 per cent.
- Replace 700 future coal-fired plants by doubling today's level of nuclear power.
- Increase solar power 700-fold to displace coal.
- Increase wind power 40-fold to displace coal.

This is the bare minimum required to keep the rate of carbon emissions at the current rate. If poor countries are allowed to emit more carbon, then richer countries like Australia will need to emit less.



The idea behind "clean coal" is to capture some carbon emissions and store these gases in depleted natural gas wells. At present, the technology is far from clean with typically only 25 per cent to 30 per cent of carbon emissions captured. Moreover, the gas would need to be stored forever and one might be concerned about how well a gas can be bottled up underground.

In this light, nuclear power looks good. Nuclear waste can be contained and returns to uranium's natural level of radioactivity after 1000 years.

University of Adelaide Physicist Professor Jesper Munch is leading an initiative to bring the physicist's quantitative, logical, objective and agenda-free perspective to this problem of global proportions. It is imperative that the world makes energy choices on unbiased accurate scientific facts, and not irrational fears or profit-based misinformation.

These are the challenges that science, business and governments face. Only a comprehensive assault on carbon emissions from a variety of scientifically-sound fronts will lead to a stabilisation at present levels. Despite the inconvenience, the production of carbon needs to be dramatically reduced. How this is best done – not when, or why – is a question that continues to need urgent attention.

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