

Clean energy special: The big clean-up

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They said Kyoto would never work. They said capping emissions was not the answer. And now the US and Australia are putting their money where their mouth is as part of a six-nation pact dedicated to using technology to halt climate change. In this special focus (see links on the right) we assess what the new partnership means for the world, identify the technologies that could make the biggest difference, and visit energy-hungry China for a glimpse of the future.

"IT'S QUITE clear the Kyoto protocol won't get the world to where it wants to go," Australian environment minister Ian Campbell told journalists on 27 July. "We have got to find something that works better."

The next day, following months of secret negotiations, officials from the US, Australia, Japan, South Korea, India and China laid out their alternative: an agreement to develop and share cleaner, more efficient technologies that will, its backers say, meet climate concerns without strangling economic growth.

According to the six countries involved, the Asia-Pacific Partnership on Clean Development and Climate is an honest attempt to reduce greenhouse gas emissions while providing "secure" energy supplies for the nations involved. It will not undermine the Kyoto protocol but complement it, by speeding up the spread of clean technologies in developing nations.

There's little doubt that this is progress of sorts. Alone among industrialised nations, the US and Australia have refused to ratify the Kyoto protocol, arguing that doing so would cripple their economies. The new pact is a recognition that something needs to be done. The announcement was even accompanied by an unequivocal statement from the White House that global warming is real and caused, at least in part, by human activity.

But while advocates of Kyoto, including the United Nations, cautiously welcomed the initiative, others were sceptical. European Community spokeswoman Barbara Helferrich says that technology alone is unlikely to reduce emissions. Environmental groups have gone further, denouncing it as a deliberate attempt to undermine Kyoto - a protectionist pact cooked up by coal burners keen to look busy while actually doing very little.

Certainly the partnership has revealed few details of its strategy. The nations involved simply pledge to cooperate on developing and sharing clean-energy technologies. This includes anything and everything, from improved energy efficiency to fusion. There are no targets and no binding agreements.

Politics aside, what can the partnership hope to achieve? What is the scale of the challenge it faces and what kinds of solutions are likely to prove most promising? Can technology really save the planet?

The task faced by the six nations is daunting. Together, its members eat up 45 per cent of the world's energy and belch out more than half its carbon dioxide emissions (see "Gas-guzzling planet"). Carbon emissions from the US account for 24 per cent of the global total, and are growing by 1.5 per cent annually. China is on track to become the world's largest emitter by 2025, and by then India will not be far behind.

That's a very big ship to turn around. A study by the US Department of Energy estimated that to meet Kyoto targets the US would need to reduce its annual carbon emissions by about 540 million tonnes between 2008 and 2012, equivalent to shutting 90 coal-fired power stations each year. The study suggested that meeting the target could cost the economy 4.2 per cent of its GDP by 2010 - around \$400 billion.

At the same time, however, the US is one of the leading developers of technology to reduce carbon emissions. And despite fears that greenhouse gas emissions can only be controlled by a revolutionary leap in technology - fusion reactors, say - most experts have little doubt that we already have the technology to stabilise atmospheric emissions.

In a paper published last year in *Science* (vol 305, p 968), Stephen Pacala and Robert Socolow of Princeton University outlined a strategy to stabilise emissions using 15 technologies that have already proved themselves on an industrial scale. Their list includes better energy efficiency in buildings, doubling the fuel efficiency of cars, generating more electricity from wind turbines and adding 700 gigawatts of nuclear power generation. The authors calculate that by implementing

seven or more of these, atmospheric CO2 levels will stabilise at today's levels by 2054. "It's an immense job," says Socolow, "but it's tractable."

One technology will be critical, he suggests: carbon sequestration, which researchers and governments are already taking very seriously (see "Going underground"). Technologies for burning coal more cleanly (see "A greener shade of black") are another key consideration.

If the new agreement smooths the spread of such technologies to developing countries, that is likely to be a good thing, says Dennis Anderson, a climate and energy expert at Imperial College London. And in fact the US already has technology exchange agreements with all of the partnership members, including a formal link with India to develop nuclear power and a research agreement with China to develop fuel cells and carbon sequestration.

This, however, raises a question: if the six countries are already sharing clean energy technology, what can the new agreement add?

The answer could, paradoxically, lie with Kyoto itself. The protocol includes a mechanism for transferring clean technology from one country to another. But each project must be approved by UN inspectors.

This is fine in theory, says Liz Bossley, a director of the London Climate Change Services group, but in practice it is a bureaucratic quagmire. "The Asia-Pacific Partnership says nuts to that," she says.

Instead, the new agreement appears to allow relatively straightforward technology transfer between companies. And, says Bossley, if it turns out that the partnership does help bring down barriers, it might actually do what its supporters claim and complement Kyoto.

The pressure is on for the US and its partners to show the world that the Asia-Pacific Partnership is more than just hot air. And with its inaugural meeting scheduled for November - just days before the next round of UN climate negotiations get under way in Montreal - the world doesn't have long to wait.