Intellectual Property Rights: The Catalyst to Deliver Low Carbon Technologies

Ian Harvey

THE CLIMATE GROUP

Breaking the Climate Deadlock
Briefing Paper

About the 'Breaking the Climate Deadlock' Initiative

'Breaking the Climate Deadlock' is an initiative of former UK Prime Minister Tony Blair and independent not-for-profit organisation, The Climate Group. Its objective is to build decisive political support for a post-2012 international climate change agreement in the lead up to the 2009 UN Climate Change Conference in Copenhagen. Its particular focus is on the political and business leaders from the world's largest economies, particularly the G8 and the major developing countries. The initiative builds on Mr Blair's international leadership and advocacy of climate change action while in office, and The Climate Group's expertise in building climate action programmes amongst business and political communities.

This briefing paper and its companions were commissioned by the Office of Tony Blair and The Climate Group to support the first Breaking the Climate Deadlock Report – 'A Global Deal for Our Low Carbon Future' – launched in Tokyo on June 27th 2008. Written by renowned international experts and widely reviewed, the papers' purpose is to inform the ongoing initiative itself and provide detailed but accessible overviews of the main issues and themes underpinning negotiations towards a comprehensive post-2012 international climate change agreement. They are an important and accessible resource for political and business leaders, climate change professionals, and anyone wanting to understand more fully, the key issues shaping the international climate change debate today.

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Executive Summary

Key Messages

- Intellectual Property Rights (IPRs), particularly patents, will be a catalyst, not a barrier, to creating and deploying low-carbon technologies.
- IPRs serve a number of important roles, including:
  - providing the incentive for business to invest in risky projects aimed at meeting market needs;
  - giving legal clarity and certainty for technology transfer transactions to take place, including creating patent pools;
  - stopping others from blocking the use of a technology by follow-on derivative inventions
- Without IPRs there is no choice: there is nothing to give, transfer, sell or license so that others can invest in its further development.
- Objections to IPRs are usually caused by a lack of understanding of their role.
- Owning IPRs is separate from the decision of how much, or whether, to charge for them.
- Threats to strong IPRs, such as easily-obtained compulsory licensing, are likely to be a strong disincentive to invest.
- Governments are best placed to fund basic research, spreading their funding quite widely, whereas the development of new marketable technologies and products is most likely to succeed quickly in the private sector
- Although companies often complain vocally about the complexities and costs of patent thickets, in practice these problems are usually solved quite effectively by cross-licensing, by creating standard-setting bodies and by developing patent pools (where these do not breach ant-trust laws).

Recommendations

- Policy-makers should support and emphasise the importance of strong IPRs for developing new low-carbon technologies.
- Plan to create anti-trust 'safe harbours' for low-carbon technologies whose owners wish to create patent pools for certainty of access and of price.
- The World Trade Organisation (WTO) would be the most effective forum for resolving debates and enforcing agreements about access to IPRs.
- Create an IPR Working Group (potentially under the TRIPS Council of the WTO) to address IPR issues and co-opt China as a potential leader in this forum.
- If limited compulsory licensing along the lines of the WTO Doha Declaration (for pharmaceuticals) were to be considered for low-carbon technologies, an independent assessment of its effectiveness and impact should be carried out immediately.

Intellectual Property Rights: The Catalyst to Deliver Low Carbon Technologies

This paper considers the importance of strong intellectual property rights (IPRs), particularly patents, for providing the necessary incentive for the huge investment that is needed in new technologies, which is required if we are to succeed in the clean energy revolution that can help to deal with climate change. It covers:

- What are IPRs?
- Catalysing an Energy Revolution – the Industrial Revolution and today
- Issues and solutions
- Potential players and the role of China

In need of an energy revolution

Intellectual Property Rights (IPRs) play a fundamental role in economic growth and underpinned the Industrial Revolution. They will be an essential stimulus to creating the new Clean Energy Revolution. IPRs will be the catalyst, not the barrier[1], for the investments, innovation, diffusion and deployment of the low-carbon technologies we need in order to limit and reduce carbon dioxide emissions. Strong IPRs can provide the necessary incentive for innovation, while policy interventions are required to price in the externalities so that the price signals will drive the market. Regulatory and policy interventions need to be focused on this issue and not on IPRs.

What are IPRs?

IPRs are legally enforceable rights over inventions and other "creations of the mind". The most important IPRs for low-carbon technologies are likely to be patents, which allow the patent owner to stop its use by others. They do not automatically allow the use of the patented technology by the patent owner, because the new invention may incorporate inventions already patented by others, for which permission to use must be sought. This is a fundamental and important point which is frequently not understood. A patent also requires publication of the invention so that others may build upon the ideas it contains.

Other IPRs include copyrights, trademarks and design rights. With the exception of copyright, however, IPRs are granted rights (i.e. they have to be examined and approved by a granting body) and they apply only to the country in which they have been granted.

Most patents are applied for only in substantial markets where they will be manufactured, sold or used. Most companies do not file patents in most Least Developed Countries (LDCs).

Other than trademarks, which can last indefinitely, IPRs have a limited life, which is twenty years in the case of patents. Statistically, radical new technologies take about twelve years after first patenting to reach the market place. Evolutionary technologies, which are usually less dominant, may reach the market in five years.

In sectors with complex technologies and products, there are often many inventions (and therefore IPRs), owned by different parties, which are used in the final product. Examples include mobile phones, computers and medical technologies such as magnetic resonance imaging (MRI). This situation is known as a patent thicket.

Where patents covering some elements of a product are owned by others, agreements to grant each other rights to use the other's inventions are called cross licences.

Where standards are set, particularly where interoperability is important (such as mobile phones and TVs), patent pools may be created where patent owners make their inventions available, through a patent pool, at predetermined prices for both putting them in and access to the entire pool.

Catalysing innovation – The industrial revolution and today

The start of the Industrial Revolution is a vivid reminder of what we owe to the patent system – and its influence on investment in high-risk, new technologies.

The development of the steam engine by James Watt was possible only because the patent system enabled him to raise large sums of money to continue the development of his engine over a long period despite initial failures. The Victorian industrialists, using the patent system to its full effect, went on to transform the economic welfare of the West over the next 250 years.

IPRs are central to the innovation that drives much of economic growth. There will be little development, deployment or diffusion of new low-carbon technologies and products unless there are strong and enforceable IPRs. They will be an essential catalyst to driving the development and deployment of low-carbon technologies. IPRs also encourage diffusion through the requirement of public disclosure of the technology.

IPRs provide:

- the incentive for business to invest in risky projects aimed at meeting market needs;
- legal clarity and certainty for technology transfer transactions to take place, including creating patent pools;
- the choice to the IPR holder how their inventions will be used – owning IPRs is separate from the decision of how much, or whether, to charge for them; and
- the ability to prevent others from blocking the use of a technology through subsequent invention and associated IPRs.

IPRs create an incentive to invest in new technology

The volume of technology development necessary to make a real difference in low-carbon technology competitiveness is likely to be very high. In order to develop new low-carbon technologies, businesses will need to invest in their development. In order to attract sufficient resources, those investments need to be able to generate attractive and sustained returns if they successfully create new products. The systems that enable the incentives necessary to provoke that level of technology investment will need to be robust and broad-based. IPRs provide that incentive, particularly in the case of patents. They provide clarity and certainty about the ability to capture the revenue streams which are created when investment is successful. Businesses will invest in risky projects if they have reasonable certainty that they will be able to benefit from success – even if the probability of success is low. This certainty is provided by the ability to protect and defend their new product revenues through IPRs.

Developing innovative low-carbon technologies in short timescales will need massive investment in many technologies and products. The obvious route to delivering this is to motivate the private sector. Simplistically, we need many investors to make huge investments and to take the risk on many different technology and product directions at once. Most of them will lose their bets, but a few will get very rich – a small price to pay for technology that we need to change the world. We need large potential rewards to attract investment capital and we need competition among technologies. Strong and predictable IPR regimes create the environment for generating these big rewards.

An example is the biotechnology and genetic research industry. Most biotech companies fail, but the combination of relatively modest government funding and the subsequent investment of many hundreds of billions of dollars in these companies is now beginning to generate therapies which benefit patients[2]. A rational analysis suggests that biotech investors, cumulatively, will not have seen a good return on their investments. Nonetheless, the investments have been made in the hope of a return and some companies have been very successful. In this sector, strong IPRs have been fundamental to progress.

Compulsory licensing, market failures, and inappropriate funding create disincentives to invest

A quick way to deter technology development in the private sector would be to reduce the potential returns to the technology developer through the threat of compulsory licensing, as happened on a large scale in the United States (US) around the 1970s[3].
If we are to stimulate the development of the many new technologies needed to address

climate change, then we must create the policy environment for one of the most profound waves of investment in the history of human civilization. That is not likely to happen by interventions that reduce the return on technology development, such as the specific or potential threat that any new technology may be subject to compulsory licensing. Threats to strong IPRs, such as easily-obtained compulsory licensing, are likely to be a strong disincentive to invest.

The problem with leaving the market to solve this problem is that most low-carbon technologies are not yet cost competitive at current prices. In the near term, current low-carbon technologies are not likely to be market competitive compared with fossil fuels without appropriate price signals or pressures such as Cap-and-Trade/Carbon Credit programmes and emissions cap mandates like those embedded in the Kyoto Protocol or in the California Air Resource Board standards. In order to solve this problem using market forces, the primary issue for policy makers is to solve these market-failure pricing problems. Any theoretical "IP constraints" are very minor when compared with the failure to address the carbon pricing externalities.

New, better and more cost effective low-carbon technologies and products may come from government or private sector funded research. The two are not mutually exclusive. We need competition among technologies, not centrally directed research and development (R&D) agendas. History suggests that government is best placed to fund basic research, spreading its funding quite widely[4], whereas the development of new marketable technologies and products is most likely to succeed quickly if left to competition within the private sector[5].

Any market failures should be addressed in ways that avoid damaging the benefits brought by the IPR system.

IPRs create legal clarity for technology transfer

Whether you wish to give away a technology free of charge or to license it, you cannot do so unless you can identify what it is that you want to transfer. You are not entitled to give away something that you do not own. IPRs provide that legal clarity and certainty. Whether that IPR bears a price is a subsequent decision. IPRs provide the framework around which legal agreements for technology transfer can be structured. Without IPRs, agreements cannot be properly defined.

IPRs enable enforceable global and compatible standards to be established with their associated patent pools – see below.

IPRs enable freedom of choice

With clarity of ownership comes freedom to choose how that ownership right will be exercised. An example is Open Source software. Copyright is an essential IPR underpinning Open Source. Without it you can neither specify what you are putting into Open Source nor demonstrate that it is not owned by someone else. Open Source is a good example of both confusion in IPR terminology and misunderstandings about the role of IPR. The correct definition of Open Source is that the source code is open and anyone is free to develop it. Yet many people, including many UK and EU parliamentarians who argue for Open Source, think it means "free software without IPRs". Open Source only works if there are IPRs, because the IPRs define what is being placed in the public domain and that no one else can lay claim to it. The consumer has to pay for much Open Source software because it is up to the developer of Open Source software whether they charge for it or not. Open Source is a different business model for software, but based wholly on the pre-existence of IPRs, predominantly copyrights.

The creation and ownership of IPRs are quite separate from the decision of how those IPRs are to be used. Without IPRs there is no choice: there is nothing to give, nor can you transfer (or sell/license) rights so that others can invest in its further development[6].

The ownership and use of IPRs should be agreed before any collaboration starts. It should be clear, fair and balanced, providing the incentive to both parties to collaborate and work effectively together. A good example is BP's clean energy programme at the Dalian Institute of Chemical Physics in China[7].

Early IPRs encourage diffusion

Patents require the publication of the technology. This is a valuable tool for those doing research because it is an easily accessible resource, although often underused. Companies have the alternative of keeping their ideas secret for as long as possible, which would reduce the ability of others to build upon their developments. The publication requirement forces early dissemination, promoting diffusion of the technology.

Early IPRs can prevent subsequent blocking patents

Not patenting can lead to a technology being blocked or constrained in its use[8]. In the 1930's penicillin was invented in the UK. At the time it was not possible to patent medical inventions and was anyway often thought to be immoral. The technology was passed to the US government in the early 1940's for further development and production. The US companies who produced it patented the production technology. When the UK wanted to produce penicillin in the mid-1940s, UK companies had to pay substantial royalties to the US companies for the right to use their patented production technology. If they had chosen, the US companies could have refused to license and blocked the UK companies from the market. Had the UK patented penicillin itself, it would have controlled what happened to penicillin. Even if they had not charged the US companies for the right to manufacture and sell penicillin (which a patent would have entitled them to), they could have negotiated a royalty free license to produce it.

Important technologies, even when funded in large part by the public sector, should still be patented. The patent owner then has ownership of the rights and can then decide and control how they are to be used.

Issues and solutions

Patent thickets: cross-licensing and patent pools

There are many sectors where large patent numbers and complexities create potential problems. These include computers, mobile phones, audio and video compression, digital and high definition televisions. Although companies often complain vocally about the complexities and costs of doing so, in practice they usually solve these quite effectively by cross-licensing, by creating standard-setting bodies and by developing patent pools (where these do not breach ant-trust laws).

Where standards are created, patent pools may be formed. Examples are the MPEG set of audio and video standards and the MPEG-LA patent pools. In these cases IPRs are clear and the cost of access is uniform and open. Well-defined IPRs enable such global and compatible standards to be established and made available on Fair and Reasonable Non-Discriminatory (FRAND) terms. These agreements are legally enforceable and provide a well-defined structure for business to make its investment decisions. Arguably the rapid diffusion of mobile telephones in Europe compared with that in the US was largely due to the standards agreed by the industry.

Creating patent pools runs the risk of breaching anti-trust laws. It may be necessary to create 'safe harbours' for low-carbon technologies whose owners wish to create patent pools for certainty of access and of price – for them and others. Europe, Japan and the US have conflicting anti-trust approaches to competition and IP issues. For example, patent licensing in the US is seen to be pro-competitive. In the EU, under the Treaty of Rome, such licensing is defined as anti-competitive unless proven otherwise[9]. These issues will need to be reconciled so that "safe harbour" behaviour that is legal in one jurisdiction is not illegal in another.

If it is clear that reducing the high cost of licensing low-carbon technology is part of a solution to rising greenhouse gas emissions in the developing world, then we should consider mechanisms for technology diffusion and increased liquidity in the shape of global energy technology patent pools. These could be securitised to improve their tradability and define a market clearing price.

Access by the developing world does not mean doing away with IPRs

This has been the most emotive and appears the thorniest of issues. It should not be. The concerns of the developing world are principally about whether they will have access at fair or affordable (not the same thing) prices to technologies being pressed on them by the developed countries. The perceived issue may be hypothetical in many situations and having no IPRs or easy compulsory licensing (with the consequent risk of free-riding), is not the solution.

For most technologies, patents are not filed in LDCs, because the small potential market does not justify the cost of obtaining patents there. In such cases domestic companies are free to use the invention in that country but not for export to a country where there is patent protection. Therefore IPRs are not likely to be inhibiting within the LDCs. If these manufacturers are permitted (through compulsory licensing) to produce for sale in a country where there is patent protection, (i.e. for commercial reasons) then that will begin to damage the incentive structure that IPRs create and should not easily be permitted.

Generally, companies will sell at differentially low prices in the LDCs if there is no leakage of these products back in to their main markets where they will sell at higher prices (e.g. as the Doha Declaration provided in the case of pharmaceuticals – see below). Some countries, such as Japan, would need to change their laws/regulations to prevent such trade.

If there are relevant IPRs which do inhibit otherwise legitimate take-up in the developing countries, there are several solutions:

1. if the IPRs are publicly held and need to be used by local LDC firms they could be licensed at preferential or zero costs. This should only occur if it does not significantly damage the broader objective of promoting investment by the private sector in low-carbon technologies for use in countries where it will have a bigger impact on reducing global carbon emissions.
2. If the IPRs are privately held there are several solutions:
    - a Their use can be paid for or subsidised by governments
    - b They can be paid for, or subsidised by, charities (as they are by the Gates Foundation or the Global Fund in the area of pharmaceuticals)
    - c Guaranteed off-takes at specified prices to provide incentives for developing low-cost solutions in these countries (as the World Bank and the above charities have done in the case of health)
    - d Compulsory licensing may be possible as a last resort, but with substantial downsides.

Compulsory licensing is not recommended

Compulsory licensing is permitted in most countries (except the US) as an exceptional measure to limit the ability of an owner of IPRs to stop others from using the IPRs in cases of abuse of monopoly or a national emergency. Its use is constrained under WTO rules and it is intended to be used as a policy of last resort. A reasonable return in the form of a royalty must be paid to the IPR owner and so compulsory licensing is not a low- or zero-cost option. Compulsory licensing is permitted in Europe but there are no recorded examples of its use, as it is generally regarded as a "nuclear option" by both governments and business, who will come to an agreement without its use being invoked.

The IPR landscape in low-carbon technologies is likely to be significantly different from that of "effect chemicals" such as pharmaceuticals where a single patent for the active pharmaceutical agent can effectively dominate use in several disease areas. Low-carbon technologies and particularly low-carbon products are likely to be more complex where many developments and technical components are necessary for the end beneficial effect and no one patent is likely to dominate. In these cases the industry participants are usually capable of negotiating cross-licences with each other. In this industrial structure, competition is likely to be intense – as it is in, say, the computer or mobile phone industries. With competition driving down prices, there will be little rationale for compulsory licensing. If the issue in the developing country is the "ability to pay" for any technology (as it was in the case of anti-retrovirals in South Africa), then either a Doha-type agreement (see below) or financial subsidy/grant will ultimately be necessary.

If compulsory licensing were to be considered, the practicalities are substantial. It is difficult to be precise about where boundaries should lie. A technology that was valuable for a low-carbon product might also be used in quite different products where there was no rationale for compulsory licensing. The dilemma then is whether to have a blanket compulsory license, which would expropriate returns from other uses, or to try and define where the boundary should lie – usually virtually impossible.

In the case of anti-retrovirals (for the treatment of HIV/AIDS), the underlying concern was that drugs already being sold at low prices in South Africa were finding their way to higher priced developed country markets. This was not only damaging these markets for the manufacturers, but also creating health problems in both markets because the products were being used improperly. This so-called "parallel trade" was largely rendered illegal by the WTO's 2001 Doha Declaration[10]. This agreement allows countries experiencing a public health emergency to manufacture affordable medicines through compulsory licensing, in a third country if necessary, but prohibits the selling of such low-priced drugs in developed country markets where there is patent protection. Successful criminal prosecutions in Europe show that the Declaration has some teeth. Others argue that it has not been effective at minimising such trade or preventing outright counterfeiting.

If limited compulsory licensing along the lines of the Doha Declaration were to be considered for low-carbon technologies, an independent assessment of its effectiveness and impact should be carried out immediately.

Based on experience in comparable industries, the necessarily crude estimate of the market costs of licensing low-carbon technologies would be in the range of 5 - 20 percent of the plant or product cost.

Patent sharing within defined areas could be encouraged by creating predefined "safe harbour" patent pooling areas. Provided that there was clarity and certainty about the future constraints, it is likely that companies would be prepared to invest. There would naturally be some correlation between their propensity to invest and the attractiveness of the set licensing terms.

Potential players

WTO and ICC to have important roles

The World Trade Organisation (WTO) is the organisation responsible for administering the key international treaty on intellectual property – The Agreement on Trade Related Aspects of Intellectual Property or 'TRIPS' which came in to effect in 1995. The WTO is actively involved in trade and business issues as well as broader economic ones. The TRIPS Council of the WTO would be the most appropriate forum within which to establish an IPR working party to deal with low-carbon IPR issues. The WTO has procedures for resolving conflicts and should be an effective forum for resolving debates and enforcing agreements about access to IPRs.

The lead institution in IPR matters is the World Intellectual Property Organisation (WIPO)[11]. WIPO has been an effective organisation in constructing legally workable global systems for IPRs. But it is not the right organisation for solving complex trade, economic and business issues involving IPRs. It has neither the experience, nor the staff, to do so, nor does its constitution allow for enforcement mechanisms, unlike the WTO.

Business organisations such as the International Chambers of Commerce (ICC) have shown that they can think constructively about climate change and IPRs. These and similar business-related organisations should be used in helping develop solutions to potential problems or to situations where there may be market failures.

The G8 Intellectual Property Experts' Group would be another forum where the issues specific to the Clean Energy Revolution and climate change could be properly analysed and economically sensible solutions developed. It would also be useful for such a group to disseminate the facts about IPRs. The author's experience in IPR discussions related to climate change is that open hostility to IPRs is often removed entirely by a factual

explanation, with real examples, of what IPRs do, how they are used, and why they are so important for creating solutions to problems.

China could play a model role

China has quickly become one of the world's largest sources of greenhouse gas emissions. China also has the potential to play a key IPR role in finding structural routes to low-carbon solutions. Contrary to common perceptions, China has embraced at the highest levels the importance of IPRs to a modern economy[12]. Its IPR laws are broadly satisfactory by global standards and the IPRs acquired under those laws are of good quality, inexpensive and quite quick. Enforcement varies widely across China, with it being generally very good in most areas of the Eastern seaboard ranging to poor in some inland and least developed areas. It is well ahead of where Japan, Taiwan and Korea were at comparable times. Prime Minister Wen Jiabao has said on many occasions – including with Tony Blair in 2007 - "Competition of the future is competition in IP". In discussions with the Chinese over the past few years it is clear that they see IPRs as an essential building block for an innovative society.

In addition to becoming a proponent of strong IPRs, China is likely to become a significant source of low-carbon technologies and products. China has been one of the most innovative societies for the past 2000 years, the last two centuries being an exception[13]. There are many indications, including patent filings by China's universities, that China is again finding its creative spark.

China has expressed its willingness to address its growing coal-fired emissions in various ways, including through Carbon Capture and Storage (CCS). In a recent discussion between Chinese and a large western company, it was the Chinese who were asking for clarity in the ownership of IPRs in a proposed CCS project. Given the high level of investment by both sides, the input of existing IPRs and the likely creation of new IPRs, they reasonably asked who was going to benefit from what.

The development of low-carbon technologies is an opportunity for the developed countries to work with China in creative ways. The G8, for example, should acknowledge how far China has come in creating an environment supportive of IPRs and should work with China to map out how best to create an IPR environment that will stimulate the creation and deployment of new low-carbon technologies. Such a move would be welcomed and taken seriously by China. This joint, developed-developing country approach would also counter the efforts of interest and lobby groups who work to minimise the role and importance of IPRs for largely protectionist reasons.

Given the large number, high quality and creativity of Chinese scientists and technologists, it is quite likely that important new low-carbon technologies will come from China. It will be in China's own interests, as well as the world's, to come up with IPR as well as technical solutions that will work for everyone.

Glossary of Terms

CCS:	Carbon Capture and Storage
FRAND:	Fair Reasonable and Non-Discriminatory (licensing)
ICC:	International Chambers of Commerce
IP:	Intellectual Property
IPI:	Intellectual Property Institute
IPR:	Intellectual Property Right
LCD:	Least Developed Country
MPEG:	Moving Picture Experts Group, a set of audio and video standards
MPEG-LA:	A firm which licenses patent pools relating to audio and video standards
TRIPS:	WTO Agreement on Trade Related Aspects of Intellectual Property Rights
USPTO:	US Patent and Trademark Office
WIPO:	World Intellectual Property Organisation
WTO:	World Trade Organisation

Endnotes

[1] *The arguments that "IPRs are a barrier" are too often caused by a lack of understanding of what IPRs are and the role they play. At least some of the negative public perceptions of IPRs are caused by business leaders taking inappropriate actions, which they would not have taken had they understood the IPR issues better. The pharma industry suit against the South African government over anti-retrovirals is an example.*

[2] *These include Herceptin and Avastin for breast and colo-rectal cancer respectively, Benefix for haemophilia B and Campath for chronic lymphocytic leukaemia (and, probably, for multiple sclerosis). Many others are in the pipeline.*

[3] *The US Department of Justice Consent Decrees and Settlements with about 100 major industrial firms (IBM, Xerox, ITT, ATT, RCA et al) had a significantly depressing effect on the level of investment in research and the development of new products by those companies over the next 10-15 years. The Consent Decrees typically included de facto compulsory licensing to anyone who wished to take a license to both existing and new technologies, driving down the returns to investment in innovation by those firms.*

[4] *Note that several years ago the US government decided that 30 years of the "War against Cancer" had not proved effective. One action was to reduce the use of "peer group review" for allocation of its research funding because it tended to reject radical new research directions outside the accepted research wisdoms. Thomas Kuhn, the MIT science historian, who coined the phrase "paradigm shift", argues persuasively in support of this view.*

[5] *Conversely, development of the atom bomb is often cited as an example where government is best placed for massive technology development. However, nuclear fission was a single phenomenon, with the practical problems of making it into an explosive device. The likely broad spectrum of low-carbon technologies argues strongly against the narrow focus usually brought by governments.*

[6] *In his 19 years as CEO of BTG plc, the world's largest technology transfer company, the author of this paper saw many technologies with substantial market potential that would never be developed because the IPR position either did not exist or was badly compromised – no company would risk investing when free riders could copy the product if it were successful.*

[7] *This is the fourth such technology research centre to be funded by BP, following those at Cambridge, Princeton and Berkeley/ Caltech. It is one of the largest international collaboration projects for the Chinese Academy of Sciences. BP plans to invest about $10m over 10 years. It took two years to discuss, negotiate and agree how the IPRs were to be handled (including background/ sideground/ foreground IPRs and new IPRs). Both sides are pleased with the structure.*

[8] *Equally, of course, the patent owner could choose to block the use of the patented technology themselves, should they wish. This is the trade-off in the patent system. In practise, however, commercial self interest encourages licensing or selling of the patented product. It also encourages people to try and invent their way around the patent, encouraging new development.*

[9] *For example, by complying with the complex provisions of the Technology Transfer Block Exemption Regulation.*

[10] *The declaration's full title is 'Declaration on the TRIPS Agreement and Public Health' see http://www.wto.org/english/thewto_e/ minist_e/min01_e/mindecl_trips_e.htm for the full text.*

[11] *WIPO is a specialised agency of the United Nations which administers the legal treaties which provide the international IP structures. It administers the international process (but not the work) for international patent filings and advises developing countries how to establish national IP systems.*

[12] *For a more complete analysis see: Intellectual Property: China in the global economy – Myth and Reality, Ian Harvey, April 2008*

[13] *Cambridge professor Joseph Needham has chronicled China's scientific and technical achievements in his 20+ volume 'Science and Civilisation in China', Cambridge University Press*

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