



## High-alert nuclear weapons: the forgotten danger

**Steven Starr argues that the continued maintenance of US and Russian nuclear weapons on high alert means that the threat of accidental (or deliberate) global nuclear war has not gone away.**

Although the Cold War is said to have ended in 1991, the US and Russia each still operate under the assumption that the other could authorise a nuclear attack against them.<sup>1</sup> The failure to end their Cold War nuclear confrontation causes both nations to maintain a total of about 2,600 strategic nuclear warheads on high-alert status, which can be launched in only a few minutes,<sup>2</sup> and whose primary missions remain the destruction of the opposing side's nuclear forces, industrial infrastructure, and political/military leadership.<sup>3</sup>

### High-alert nuclear weapons: a brief history

High-alert, launch-ready nuclear weapons, i.e. operational rocket-mounted nuclear warheads capable of being launched in 15 minutes or less, have been deployed in the US and the USSR/Russia for decades. The solid-fuelled US Minuteman inter-continental ballistic missile (ICBM) went on alert in October 1962<sup>4</sup>, and by 1965, 800 Minuteman I missiles had been deployed.<sup>5</sup> By the mid-1970s, the USSR had deployed a variety of second generation liquid-fuelled ICBMs capable of quick launch.<sup>6</sup>

The Cold War created an arms race that led to the development of apocalyptically destructive weapons.

Fear of a nuclear surprise attack was exacerbated by the development of ICBMs armed with multiple independently-targeted re-entry vehicles, which appeared to be ideally suited for a nuclear first-strike. Because no defence against such an attack was found to exist, the only military 'solution' seemed to require the launch of one's own ICBMs from their silos before they were destroyed.

By the early to mid-1980s, the US<sup>7</sup> and USSR<sup>8</sup> had each created automated nuclear command and control systems that worked in conjunction with a network of early warning systems<sup>9</sup> and their nuclear-armed ballistic missiles. Thus both nations had the capability to launch strategic missiles on tactical warning in less than 30 minutes, the nominal flight time of land-based ICBMs travelling between the US and Russia.<sup>10</sup>

This gave both nations the *capability* to detect the launch of an enemy nuclear attack and order a retaliatory launch of nuclear-armed missiles before the arrival of the perceived attack was confirmed by nuclear detonations (Launch-on-Warning, or LoW). It seems obvious that the only purpose in developing a LoW *capability* was – and is – to be able to implement it through a *policy* of LoW (which becomes standard operating procedure, written into warplans, and operational manuals).

Despite the apparent dangers of LoW, including the launch of a nuclear retaliatory strike based upon a

*Continued on p.16...*

## Contents

### SGR News .....3

A few words from the Director .....	3
Nuclear weapons update .....	3
Core funding success.....	3
New military universities report.....	4
New corporate R&D project .....	4
Climate and energy update.....	4
Emerging technologies .....	4
Sponsors .....	5
Ethical careers update.....	5

### Feature Articles .....6

Military influence at universities .....	6
UK climate strategy .....	8
Nuclear disarmament campaign.....	10
Defence training academy .....	11
Nuclear waste management .....	12
Carbon emissions and housing .....	13
Expanding renewable energy .....	14
High-alert nuclear weapons (cont.).....	16

### Publication Reviews.....19

Nanotechnology: risk, ethics, law .....	19
Just war: psychology and terrorism .....	20
Fuelling the future.....	21
Trident: the deal isn't done .....	22
GM contamination.....	22

### Letters .....23

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## Editorial Issues

### The editorial team for this issue of the SGR Newsletter was:

- Stuart Parkinson
- Kate Maloney
- Jane Wilson

The opinions expressed within, including any advertisements or inserts, do not necessarily represent the views of SGR.

Please send articles, reviews and letters for the newsletter to [newsletter@sgr.org.uk](mailto:newsletter@sgr.org.uk) or the SGR postal address (above).

Copy deadline for next issue: 14 November 2008

## Join the SGR Forum e-mail list!

SGR Forum is our internal e-mail list. It is used mainly for news and announcements (of SGR and other events). Forum members also engage in the occasional brief discussion via this channel, for example when a member requests information, advice or help. All SGR members who have internet access are encouraged to join.

To join visit <http://mailman-new.greennet.org.uk/cgi-bin/mailman/listinfo/sgrforum> and following the (very straightforward!) instructions from there.

SGR has another e-mail list on Population, Consumption and Values. For more info, or to join this list, please contact Alan Cottey at [AlanC@sgr.org.uk](mailto:AlanC@sgr.org.uk)



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## A few words from the Director

Tensions are again high between Russia and the West in the wake of the Russia-Georgia conflict and the US-Poland-Czech Republic deal on 'Missile Defence'. Such a situation should remind us of the importance of progress on nuclear disarmament. As Steven Starr's article shows (see p.1), thousands of US and Russian nuclear weapons are still on high alert nearly 20 years after the end of the Cold War – threatening the world with catastrophe should the fail-safes not work. Starr points out how close we came with the Norwegian weather balloon incident in 1995. He could have also pointed to the Cuban Missile Crisis of 1962 or the Able Archer incident in 1983 to demonstrate that we are taking a huge risk with letting the current situation continue. In a world where political and economic instability is growing – as seen with recent rises in fuel and food prices and, as we go further into the future, with increasing

climatic change and water resource problems – this risk is only going to become more acute.

Yet, the British government's position on nuclear weapons seems to become more schizophrenic by the day (see below) when a clear, unambiguous commitment to nuclear disarmament is urgently needed.

It is in that context that scientists, engineers and other professionals can play an important role in helping to convince wary politicians of the need to take the necessary steps. However, as Chris Langley points out (see p.6), our universities are increasingly being infiltrated by military thinking – with departments of engineering and physical sciences being in the front line.

However, there are some hopeful signs. Most notable are a range of nuclear disarmament initiatives by senior political figures in the USA, Australia, and elsewhere, together with the setting up of the new International Campaign Against Nuclear weapons (ICAN – see p.10) – which SGR has joined. In UK universities as well, we are finding significant opposition to the militarisation trend, and this we are continuing actively to encourage (see p.4).

It is important we make the most of these opportunities.

**Stuart Parkinson**  
<StuartP@sgr.org.uk>

## Nuclear weapons update

There have been three significant, but little noticed, events related to Britain's nuclear weapons policy in recent months. In January, Gordon Brown, in a speech in Delhi, declared that the UK "*will be at the forefront of the international campaign to... ultimately achieve a world that is free from nuclear weapons*" (see p.10). In June, the US-based Federation of American Scientists published a report saying that the last 110 American nuclear weapons had been removed from British soil (air drop bombs from USAF Lakenheath) perhaps as early as 2006, citing a 2007 nuclear inspection document of the US military<sup>1</sup>. In July, papers released under the Freedom of Information Act, revealed that a senior Ministry of Defence official had told arms industry representatives that the "intention" was to replace the warheads of the Trident nuclear weapons system. For such a senior official to make such a statement strongly suggests that a decision in principle to replace these nuclear warheads has already secretly been taken – something denied by the government<sup>2</sup>.

These events highlight the continuing contradictory nature of UK nuclear weapons policy. The government's enthusiasm for pursuing the goal of global nuclear disarmament does seem to have increased recently. However, the credibility of Britain's efforts in this area are considerably undermined given the continuing commitment to the Trident replacement programme, and the fact that this would mean the UK could retain its own weapons system until 2050.

SGR – as you would expect – has been rather more coherent in making the case for disarmament. Stuart Parkinson spoke at a side event at the negotiations on the nuclear Non-Proliferation Treaty in Geneva in May (see p.4). In the run-up to these negotiations, SGR signed an NGO letter calling for all nuclear weapons to be taken off 'high alert' immediately (see lead article on p.1). SGR members also took part in several campaign events, including the 50th anniversary conference of the Campaign for Nuclear Disarmament in January, the Easter march to Aldermaston, and Hiroshima and Nagasaki commemorations in August. As mentioned above, SGR also joined the new International Campaign Against Nuclear weapons (ICAN) – see p.10.

For more information, email <PhilW@sgr.org.uk>

### References

1. Borger J (2008). US removes its nuclear arms from Britain. The Guardian, 26 June.  
<http://www.guardian.co.uk/world/2008/jun/26/usforeignpolicy.nuclear>
2. Taylor M (2008). Britain plans to spend £3bn on new nuclear warheads. The Guardian, 25 July.  
<http://www.guardian.co.uk/world/2008/jul/25/nuclear.weaponstechnology>

## Core funding success

SGR has been successful in its latest application for core funding to the Joseph Rowntree Charitable Trust (JRCT). We have been awarded a grant of £45,000 over three years.

This will help to make the organisation more financially secure and allow us to retain key staff. It also means we can continue our programme to expand the membership, both increasing our influence and improving our longer term financial stability.

We are very grateful to the JRCT for this grant, which follows on from our previous three-year grant and demonstrates recognition of the continued value of SGR's work.

## New SGR report on military involvement at UK universities

In June, SGR launched a new report entitled *Behind Closed Doors: Military influence, commercial pressures and the compromised university* written by Chris Langley, Stuart Parkinson and Philip Webber. Among the conclusions of the report were that there are much higher levels of military involvement in UK universities than national statistics indicate, and there is a disturbing lack of openness and accountability within these institutions concerning this involvement. The findings are discussed in depth on p.6.

The report received very good media coverage, with articles in *The Guardian*, *Nature*, *Times Higher Education*, the *Al Jazeera* website, *Research Fortnight*, *People and Planet News*, *The Friend*, *Science and Public Affairs*, *Media Lens*, several local papers and on numerous websites.

To date, over 400 copies have been downloaded from the SGR website. Printed copies are being sent to policy-makers, peace campaigners, science policy analysts, journalists and other 'opinion formers'. In addition, approximately 700 copies of SGR's two other publications on military science and technology – *Soldiers in the Laboratory* and *More Soldiers in the Laboratory* – have been downloaded in the last six months.

The launch of this new report complements our broader work challenging the growing militarisation of science, engineering and technology. Most notable was a side event at the latest round of the negotiations on the nuclear Non-Proliferation Treaty (NPT) in Geneva. This event was organised by our international partners, INES, and Stuart Parkinson gave a presentation summarising our research in this area, especially highlighting the role of the nuclear weapons laboratories in the UK and USA. In addition, Chris Langley took part in a UK conference on science and 'defence' organised by the influential Foundation for Science and Technology. Chris also authored a comment article in the international magazine, *Engineering and Technology*, and was interviewed by *Nature* concerning a new civilian research laboratory at Imperial College London that was being set up partly with funding from the Atomic Weapons Establishment.

Our thanks go to the Polden Puckham Charitable Foundation, Andrew Wainwright Reform Trust, Martin Ryle Trust and the INES Special Projects Fund, which provided the funding for this work to be undertaken.

For more information, email  
<ChrisL@sgr.org.uk>

## Climate and energy update

SGR's recent activities in this area have focussed on renewable energy, climate science and the links between climate and conflict.

With the government revealing proposals for a new strategy on renewable energy, this issue has returned to prominence. SGR made a submission to an inquiry by the House of Lords Economic Affairs Committee on the economics on renewable energy. Martin Quick had a letter on this issue published in *The Guardian*. Martin also gave a presentation about this and related energy issues at a conference for energy professionals in Bath. We also wrote to the Department for the Environment, Food and Rural Affairs criticising the government view that UK renewable energy targets could be met in part from overseas action.

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On the issue of climate science, Stuart Parkinson gave a presentation summarising some of the latest research findings at the Climate Forum – the annual conference for climate campaigners, which took place in London in June. He was also interviewed on this issue for a programme on 'Climate Radio'.

Interest in the linkages between climate change and conflict also continues to grow. Quaker Peace and Social Witness and the Movement for the Abolition of War (MAW) hosted a roundtable for campaigners in April, at which SGR was represented by Martin Quick. We supplied further technical information about the issues to MAW after the workshop. Stuart Parkinson also took part in a workshop on climate and conflict at the Climate Forum in June.

For more information, email <StuartP@sgr.org.uk> or <MartinQ@sgr.org.uk>

## New project examining corporate R&D begins

SGR has begun a new project to investigate the corporate influence on research and development in the UK, in particular highlighting the detrimental effects and making recommendations for reform. The project is initially focussing on the effects of the pharmaceutical, fossil fuel and biotechnology industries. Further investigation of military corporations will also be carried out.

The first stage began in May thanks to a generous grant from the Polden Puckham Charitable Foundation. The main project worker is Chris Langley. We are currently seeking funding for the remainder of the project.

For more information, email  
<ChrisL@sgr.org.uk>

## Emerging technologies

In recent months, SGR has carried out several activities on the issues of GM crops and synthetic biology.

In March, SGR put in an objection to a proposed open-air trial of genetically modified potatoes by Leeds University because of potential risks. In April, Eva Novotny took part in a workshop run by the Advisory Committee on Novel Foods and Processes, questioning the committee about its recommendations to the UK government on GM crops.

Chris Langley gave a presentation on concerns related to synthetic biology at the Dana Centre in London. He also took part in two other events on synthetic biology: one organised by the Royal Academy of Engineering in April, and the 'Synbiosafe' e-conference in May.



## Christopher Meredith 1916-2008

Christopher Meredith, former Secretary of Scientists Against Nuclear Arms (SANA), has died at the age of 91. He was a lifelong campaigner for peace and social justice. In the early days, his focus was opposition to fascism, and trade union activity to improve social justice. Then came the nuclear disarmament campaigns with every Easter spent on the Aldermaston march.

His university education was at Queen Mary College, London, where he obtained a first in Botany. On graduating, he started working for a publisher, only for war to intervene, leading to him to join the Army intelligence corps. He later described himself as a 'pacific' soldier and it took many years for his daughters to realise that this did not mean he fought in the Pacific! After the war, he worked for the British

Standards Institution, rising to become its Technical Director.

Christopher was one of the founding members of SANA in 1981, taking on the role of Secretary of its National Coordinating Committee from its inauguration until 1985. He played a critical role in developing and maintaining SANA's activities. He was widely respected by his colleagues, and was adept at defusing conflict between other Committee members. His colleagues from that time describe him as committed, conscientious and inspiring.

His other activities in the peace movement included being a Vice President of the World Disarmament Campaign. He also co-edited *World Disarmament: An idea whose time has come*. Although published in

1985, this volume still contains much material relevant to today's continuing peace campaigns, including discussion of why disarmament has not yet been achieved.

He remained a committed member when SANA merged with other organisations to form SGR in 1992, and was an active peace campaigner until deafness and lack of mobility restricted him. He will be sadly missed.

**Stuart Parkinson**

**With thanks to Frank Jackson, Tom Kibble and Owen Greene**

## Tom Kay 1935-2007

Tom Kay, architect and founder member of Architects for Peace, has died aged 72. He was an activist and campaigner on many fronts. His last place of political activism was in his country of birth, Palestine, where he went in 2001 to teach Palestinian students at Birzeit University, near Ramallah. Later, he recorded the ancient settlements of Palestine for the Palestinian Centre for Architectural Conservation, ahead of the Israeli bulldozers.

Both Tom's parents were European Jews and Communists. In the mid-1930s they visited Palestine, where Tom was born, though it was not until he was 15 that he discovered his Jewish roots. He was a conscientious objector, who refused to do national service in the late 1950s. He took part in anti-nuclear action, sitting in a concrete mixer in Swaffham, Norfolk, to oppose the building of the Thor missile base.

The house and studio that Tom built for his family in Camden, London on a very tight site was the first project to win him professional acclaim. He subsequently had a wide influence on architectural thinking about inner-city living.

He helped found Architects for Peace in 1981 and remained a member through subsequent organisational mergers until Architects and Engineers for Social Responsibility became part of SGR in 2005. He will be sadly missed.

**Kate Macintosh**

## Richard Rogers made Companion of Honour

SGR sponsor and leading architect, Richard Rogers has become a Member of the Order of the Companions of Honour (CH) in this year's Queen's birthday list.

Founded in 1917, the CH is one of the highest awards that can be given by the UK government and is in recognition for an individual's contribution to the arts, science, medicine, politics or religion. The award, in Richard's case, has been made "for public service and services to architecture".

Only 65 people from the UK and Commonwealth countries are Companions of Honour at any one time. Current recipients include David Attenborough, Harold Pinter and another SGR sponsor, Stephen Hawking.

Richard Rogers said: *"I am very proud to be made a Companion of Honour and grateful for the opportunity it gives me to raise awareness of the importance of quality in architecture and design. I would also like to thank all those people I have worked with in more than 40 years as an architect – this recognition is as much for their achievements as it is for mine."*

**Based on: Rogers, Stirk, Harbour and Partners website (2008)**

[www.rsh-p.com/render.aspx?siteID=1&navIDs=1,6,12,1476](http://www.rsh-p.com/render.aspx?siteID=1&navIDs=1,6,12,1476)

## Ethical careers update

SGR's programme on ethical careers in science, design and technology has continued, buoyed by the news that military-industrial employers continue to fall in popularity with job-seeking science students.

Since the start of the year, SGR has had a presence at ten careers events, including university careers fairs in Birmingham, Cambridge, Cardiff, Leeds, Limerick, Loughborough, Manchester, and Oxford (twice). In March, Chris Langley took part in a panel debate at University College London that discussed ethics and ambitions in career choice.

Over this period, over 2,500 copies of SGR's ten ethical careers publications have been downloaded or picked up at careers fairs. The demand continues to be high despite our first five publications now being out of print.

Finally, thanks to the volunteers who helped run SGR stalls at careers events: Barbara Barrett, Hilary Browne, Alan Cottey, Richard Jennings, Kate Macintosh, Martin Quick, Richard Tregear, Dave Webb and Patricia Xavier.

**If you are interested in helping to run future stalls, please contact the SGR office on <info@sgr.org.uk>.**

## Behind closed doors – military influence at UK universities

**Chris Langley summarises SGR's latest research on military influence at UK universities, highlighting a range of serious concerns and making recommendations for reform.**

SGR has been active since 2003 in uncovering the many ways in which the military sector is involved in science, engineering and technology (SET) in the UK. In order both to promote informed debate and to push for change in this area, we have used our assembled research to produce reports, articles and presentations, and to network with a number of different groups and individuals, including a great many academics. All of this activity has generated considerable interest and discussion in a wide variety of fora both in the UK and abroad. These activities have also provided the opportunity for many in the SET community to give voice to their fears about the loss of the traditional academic ethos in the UK.

This June saw SGR launch an in-depth study of the more subtle, but nonetheless significant, aspects of military involvement in a sample of 16 universities in the UK (see Box). The study, entitled *Behind Closed Doors*,<sup>1</sup> describes the impact on both individuals and universities of the increasing military involvement with the UK academic community.

Growing military sector involvement with universities in the UK over the past twenty years can be traced to two major trends. The first is the increasing dependence on high-technology, weapons-based approaches to tackling complex security threats, most recently as part of the so-called 'War on Terror'. This 'Revolution in Military Affairs' is discussed in detail in SGR's 2007 report, *More Soldiers in the Laboratory*.<sup>2</sup> The second trend is the rapid commercialisation of universities, which encourages them to work more closely with large corporations in teaching, training and research. This trend is encouraging universities to prioritise work that yields short-term economic benefits, with the real danger that free enquiry and the pursuit of socially and environmentally orientated work are marginalised.

In 2002, the efforts to involve UK universities in military partnerships were stepped up. In this year, three new programmes – the Defence Technology Centres, Defence Aerospace Research Partnerships and the Towers of Excellence – were launched. Then,

in late 2006, the government published its Defence Technology Strategy, which marked a further concerted push to involve universities.

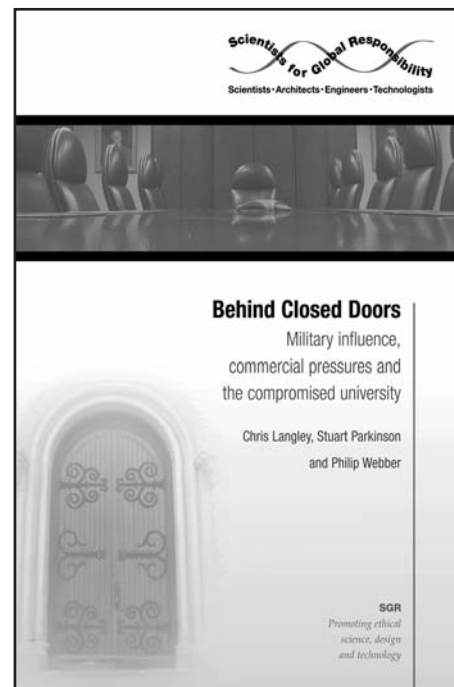
As we pointed out in previous reports and presentations, there are a number of major concerns that relate to the growing military-university links, not least the way in which such collaboration can contribute to the marginalisation of alternative approaches to dealing with a broad range of security problems. In *Behind Closed Doors* we look at this issue in more depth, using the Freedom of Information Act, interviews with senior university staff and other sources of information to examine the ways in which both military and related commercial involvement affects researchers and the traditional ethos of universities.

### Secrecy and skewed research agendas

Our findings reveal much higher levels of military involvement – both corporate and government – than officially acknowledged, together with a disturbing lack of openness and accountability on the part of universities and other institutions. Our data also raise serious concerns about bias in research agendas. Questions are also raised by our investigation about the value for money of public expenditure in UK universities.

*Behind Closed Doors* assembles data illustrating that military involvement with the funding and governance of research, teaching and training at UK universities is far more prevalent than is generally acknowledged. The financial data that we collected in this study indicates that official figures for military funding at universities underestimate the extent considerably, possibly by as much as five times.

The present study indicates that a very high proportion of the over 100 universities in the UK receive military funding. For example, 42 out of 43 UK universities investigated in this and three previous studies have been found to receive funding to pursue military objectives (data on the other university was inconclusive). A worrying trend became clear: high prestige universities and departments of engineering and physical sciences were over-represented in university-military partnerships. This trend can potentially limit the availability of skilled staff for work in alternative civilian areas, and thus reduce access



### Case study universities

Birkbeck College, London  
Bournemouth  
Bristol  
Cambridge  
Edinburgh  
Exeter  
Imperial College, London  
Leeds  
Leeds Metropolitan  
Newcastle  
Oxford  
Plymouth  
Sheffield  
Southampton  
University College, London  
West of England

to independent expert advice. Indeed, lucrative contracts from this highly profitable sector can be very appealing to researchers on tight budgets. But, as we pointed out in *Soldiers in the Laboratory*,<sup>3</sup> it is important to remember that funding is only part of the influence exerted by the military within academia.

A further observation arose during the study concerning the prevailing ethos found within universities in the UK today. Universities present themselves, on their websites and in promotional material, as open, accountable institutions yet, when challenged during this study, they fell well short in a

number of important respects. These included the difficulties that we encountered in trying to locate detailed, comprehensive data on the different kinds of military involvement in universities. It was apparent that this is due to a combination of incomplete record-keeping, commercial restrictions, pressures on researchers and, most disturbingly, evasiveness of officials. We found that senior university academics, corporations and researchers are very reluctant to discuss details of their activities when they are related to military involvement within universities, despite these institutions receiving significant public funding or co-funding. Therefore we were frustratingly unable to learn more about such issues as intellectual property rights, teaching direction and openness in partnerships involving the military sector. Even details of the publications that arose from military funding were withheld by some of those universities approached using the Freedom of Information Act.

Our interviews and discussions with many at the sample of 16 universities that we investigated showed that there is considerable disquiet among non-military funded university staff about growing military presence within their institutions. One of the main concerns is related to general worries about the power of vested interests – especially large

corporations – to influence the research agenda and make it more ‘conformist’ and less transparent. Another concern, about which we heard, was that high-technology, weapons-based approaches to dealing with security threats or other global problems are unduly given priority over, for example, political, diplomatic or other non-technological approaches. Funding and other pressures mean that these staff members, and presumably others in similar situations, often feel unable to express their concerns openly, and see their views as marginalised.

## Agenda for change

*Behind Closed Doors*, building on our previous investigations, suggests a number of important recommendations, in order to curb the undue influence of the military sector and to re-invigorate the traditional academic ethos. Our recommendations are directed at universities, researchers and government. We encountered a number of difficulties while collecting data, which led us to feel strongly that universities need to remember that they are publicly-funded institutions and should therefore be more accountable. University managers too should be more open and transparent about the funding that their university receives and be responsive to legitimate scrutiny, like ours. Secrecy damages both the health and the public perception of science and technology.

During the course of the research for *Behind Closed Doors* and earlier *More Soldiers in the Laboratory*, it became clear to us that steps need to be taken as a matter of urgency to ensure that Freedom of Information requests are properly dealt with and that the legislation is understood and requests are acted upon promptly and efficiently.

Additionally, there needs to be much greater realisation by senior academics and university managers that military involvement on campus is an area of serious ethical concern among members of staff and students, as well as in the wider community – and that there consequently needs to be a much wider debate on this issue.

Over the past five years, SGR's programme on military influence on science and technology has looked at a range of issues, including many related to the military involvement in UK universities – as funders and partners in research and as framers of teaching programmes. Our work strongly suggests that professional and policy circles must give greater recognition to the fact that there are viable and effective alternatives to the dominant high-technology, weapons-based approach to security problems. At present, thinking within the military

sector still owes much to outmoded notions of where threats lie and is coloured by the power of multinational military corporations, influencing the choice of response.

Furthermore, academics throughout the UK must feel able to speak openly about and question prevailing orthodoxies, including the growing commercialisation and militarisation of UK universities. The predominant commercial ethos across the university sector must be examined in detail and where necessary challenged. Many in the UK realise that our universities are too important for their independence to be compromised by over attention to business objectives.

There are some encouraging signs that the UK government, in its National Security Strategy launched in March 2008, recognises that security is about much more than weapons and their support platforms, but how these signs might actually translate into action is going to be critical. As scientists and concerned citizens, we urgently need to have a fully informed and open discussion in the UK on the role of universities in society, their damaging commercialisation and their involvement in the security strategy that we adopt.

**Dr Chris Langley is SGR's principal researcher. He is either sole or lead author of the SGR reports, *Soldiers in the Laboratory*, *More Soldiers in the Laboratory* and *Behind Closed Doors*. For more information about SGR's latest work in this area, see p.4.**

## References

1. Langley C, Parkinson S, Webber P (2008). *Behind Closed Doors: Military influence, commercial pressures and the compromised university*. SGR.
2. Langley C, Parkinson S, Webber P (2007). *More Soldiers in the Laboratory: The militarisation of science and technology – an update*. SGR.
3. Langley C (2005). *Soldiers in the Laboratory: Military involvement in science and technology – and some alternatives*. Editors: Parkinson S, Webber P. SGR.

All three reports can be downloaded from:  
<http://www.sgr.org.uk/ArmsControl/MilitaryInfluence.html>

Paper copies can be ordered from the SGR office - please phone 01303 851965 or email <[info@sgr.org.uk](mailto:info@sgr.org.uk)> for prices.

## The main findings<sup>1</sup>

- There is significantly more research and teaching supported by the military at UK universities than officially acknowledged. Data from our sample indicates that military funding could be as much as five times higher, and be present in the vast majority of universities.
- Universities, when challenged during our study, were lacking in openness and accountability. For example, detailed data on military involvement was very difficult to obtain, and many senior staff either refused or were reluctant to speak to us – especially if they received military funding.
- Many academics who did speak to us expressed concern at the levels of military involvement in teaching and research.
- Military corporations, despite claims of transparency and corporate responsibility on their websites, refused to respond to our requests for detailed information on their partnerships with universities.

## UK climate strategy – are we making progress?

**Stuart Parkinson examines the UK's record on reducing greenhouse gas emissions, arguing that official figures hide a lack of progress and highlighting the key reforms that need to be made.**

Over the last few months, the government has been very upbeat about its action on climate change.

At the start of the year, it gave formal backing to a new generation of nuclear power stations, arguing they were necessary to help reduce carbon emissions. Indeed, in a speech a couple of months afterwards, Industry Secretary, John Hutton, declared he wanted to make the UK “the gateway to a new nuclear renaissance across Europe”.<sup>1</sup>

In June, the Department for Business (known as ‘BERR’) launched proposals<sup>2</sup> for further development of renewable energy, aiming for a ten-fold increase in the proportion of total energy supplied, from about 1.5% in 2006 to 15% by 2020.

Then, in July, the government released the latest progress report on its climate change programme.<sup>3</sup> This included figures for UK greenhouse gas (GHG) emissions, showing that the level in 2006 was just below 620 million tonnes<sup>4</sup> (Mt) – almost 21% below the 1990 level.<sup>5</sup> This is well beyond the target of a 12.5% cut by the period 2008-2012, agreed under the Kyoto Protocol.

Another significant development is the new Climate Change Bill, which is currently making its way through parliament. If passed, it will set down a legal requirement for the UK to reduce its emissions of carbon dioxide (the main GHG) by at least 60% by 2050.

On the face of it, it seems like the government is finally giving the issue the urgency it needs. But is progress really being made? And are the future plans the right ones?

### 8 Progress at a national level

At first sight, the 21% cut in UK GHG emissions is impressive. However, this headline figure hides some important shortcomings.

The first cause for concern is that 33Mt are allowances bought through the EU Emissions Trading Scheme.<sup>6</sup> This scheme has been much criticised in its early years for setting targets that are too weak, and thus calling into question the true value of the allowances.

An even more significant problem is that the national GHG emissions data does not include those emissions from our contribution to international aviation or shipping. While emissions from shipping are approximately the same as in 1990, those from aviation have more than doubled.<sup>7</sup> Furthermore, the total warming effect of emissions from aircraft is estimated to be about three times that of the CO<sub>2</sub> emissions alone – due to conditions in the upper atmosphere.<sup>8</sup> These factors would add about 60Mt to the official estimate of the total GHG emissions of the UK.

But there is even worse news from a study published by researchers at the York office of the Stockholm Environmental Institute.<sup>9</sup> This assessed the net effect on the UK's CO<sub>2</sub> emissions of the increasing amount of energy-intensive goods being imported from countries such as China. Their conclusion was that the UK, through its net imports, was responsible for an extra increase of 105Mt of CO<sub>2</sub> emissions between 1992 and 2004. In effect, the UK has moved production of huge amounts of energy-intensive goods offshore during this period and claimed this as emissions reduction activity.

So, if we put all these factors together, what is the actual progress on reducing the total GHG emissions of the UK? Far from an emissions reduction of 21% since 1990, we have actually seen no reduction at all (or, arguably, a small rise).

In order to try to highlight where the problems are and where the main action needs to be taken, it is necessary to look at the main sectors in the UK economy.

### Transport sector

Let's start with the transport sector. Emissions in this sector covered by the Kyoto targets have risen by 12% since 1990.<sup>10</sup> The vast majority of these emissions are from road transport. Not included, as discussed above, are emissions from international aviation – which have grown by 100% over this time period.

What does the future hold? With the government's current plans for major airport expansion, passenger demand is set to more than double by 2030, with direct CO<sub>2</sub> emissions from aviation predicted to rise by a massive 57% by this time.<sup>11</sup> Accounting for upper atmosphere effects, this translates into about an extra 60Mt.

The situation for road transport is not hopeful either. Even including the effects of the latest policy measures to reduce CO<sub>2</sub> emissions from cars, the Department for Transport still predicts that domestic transport will be responsible for higher carbon emissions in 2020 than in 1990.<sup>12</sup>

The only silver lining arises from the recent rises in fuel costs, which are leading to low-cost airlines cutting routes and falls in the sales of ‘gas-guzzling’ cars.

It is clear, however, that much more radical policy measures are needed. Airport expansion cannot be allowed to continue and we cannot rely mainly on incremental increases in vehicle efficiency to deliver emissions reduction. We need a much more concerted effort to encourage people to switch transport modes to trains, coaches, buses, cycling and walking.

### Residential sector

Despite a range of policy measures designed to help improve home energy efficiency and expand the provision of domestic renewable technologies, GHG emissions from the residential sector are also higher now than in 1990.<sup>13</sup> One major factor has been the ever-expanding use of electronic appliances, which has again outstripped improvements in efficiency. Another factor – as pointed out in *SGR Newsletter* 33<sup>14</sup> – is the over-bureaucratic attempts to subsidise solar panels and other cleaner energy technologies. However, the biggest factor in a failure to reduce emissions has been the unambitious attempts to improve home insulation.

While there are some important and policy initiatives in the pipelines – such as the banning the sale of inefficient light bulbs by (probably) 2011, and the target of making all new houses built in England zero carbon by 2016 – the planned measures could be significantly stronger.

The biggest failing is the lack of ambition in improving the energy efficiency of existing homes. In frustration with government policy, a new coalition – the Existing Homes Alliance – has been formed to push for an 80% reduction in the carbon emissions of the housing sector by 2050 (see p.13). This would have the twin benefits of delivering major GHG emissions reduction and tackling fuel poverty.



## Commercial sector

One area of the economy that government statistics indicate has cut GHG emissions substantially is business (including industrial processes). Emissions in 2006 were 30% below the base year<sup>15</sup> – due mainly to a combination of reduced energy use and reductions in GHGs apart from CO<sub>2</sub>.

So, is commerce the big success story in the UK climate strategy? Sadly not, and the reason is mainly the one discussed earlier – because of a growing imbalance between the import and export of energy-intensive goods. While UK industry has made some important efficiency and other technological improvements, the relocation of many industrial processes abroad has been a key factor in the reduction shown in the official statistics.

Put simply, we will not make significant and real cuts in emissions in industrial emissions unless we cut our consumption of energy-intensive goods.

## Energy supply sector

The energy supply sector (which includes electricity generation and fossil fuel production) is responsible for the largest share – 36% – of UK GHG emissions.<sup>16</sup> Currently, emissions in this sector are 15% below those in the base year. This large drop has been mainly achieved through a large-scale switch from coal (the highest carbon fuel) to gas for electricity generation. A small expansion of renewable energy has also made a contribution. However, emissions now are only at the same level as in 1995 because of a recent rise in coal use.

In order to make further progress in this sector, the government plans a nuclear renaissance and a large expansion of renewable energy, together with other measures such as more efficient use of coal and some end-use efficiency improvements.

SGR has criticised the attempt at a nuclear renaissance on many grounds,<sup>17</sup> but perhaps the most pertinent to highlight here is the industry's continuing problems with delivering on its promises. Two current cases exemplify the point: the construction of the Olkiluoto-3 nuclear power plant in Finland (of the type most likely to be built in the UK), which is two years' behind schedule and well over budget;<sup>18</sup> and the recent collapse of a financial deal between the French and UK nuclear corporations, EDF and British Energy.<sup>19</sup>

On the renewable energy side, after many years of frustration, we are finally starting to see a rapid expansion of electricity from renewable energy sources, especially wind.<sup>20</sup> However, the UK is still

failing to implement some of the most successful policies used by Germany in its recent large and rapid expansion of renewable energy, notably 'feed-in tariffs'. We urgently need this to change.

All this promised emissions reduction is threatened, however, if the UK simply goes ahead with a new generation of (albeit more efficient) coal power stations without a clear strategy for minimising emissions. Disturbingly, progress on the commercialisation of technologies such as coal gasification and carbon capture and storage has been all too slow.

We also need to deal with serious side effects caused by liquid biofuel. This renewable energy source is being phased in to try to reduce GHG emissions of road vehicles. However, much biofuel production is contributing to major problems – such as deforestation and food insecurity – and these must be dealt with if this source is to make a positive contribution to environmental protection.

## More concerted action

It should be acknowledged that the UK has made some progress with tackling GHG emissions. While many other industrialised countries have seen their emissions rise rapidly – especially when international aviation and imported energy-intensive products are taken into account – at least the UK has managed to (roughly) stabilise them.

However, as the recent reports from the Intergovernmental Panel on Climate Change have shown, we urgently need to put in place programmes that will deliver real and large-scale cuts over the next few decades. Some of the major policies needed to bring this about have been highlighted above. However, the overall strategy must be to reduce greatly the demand for energy-intensive goods and lifestyles. Key in doing this will be the implementation of strong economic policies – such as ecological tax reform and personal carbon allowances – and facing down the opponents of these policies such as the motoring and aviation lobbies.

It will not be easy, but this is the only route likely to deliver enough emissions reduction to prevent devastating climate change.

**Dr Stuart Parkinson is Executive Director of SGR. His background includes academic research and policy work on climate and energy issues.**



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## New campaign to achieve global nuclear disarmament

**Alison Whyte introduces a new global campaign for a Nuclear Weapons Convention, and discusses some hopeful signs of progress.**

There are still more than 25,000 nuclear weapons around the world<sup>1</sup>. The use of even 100 Hiroshima-size weapons could lead to tens of millions of deaths and severe global climatic consequences (see p.1). This is within the capacity of the arsenals of not only the USA and Russia, but also China, France, and the UK.

The Nuclear Weapon States are currently developing new, more usable weapons and proliferation is an extremely serious problem. Nuclear technology and material are widely available and often poorly secured, and hence a potential target for terrorists. The last major international negotiations on nuclear disarmament in 2005 broke up without agreement. Against a background of increasing global instability – due to problems such as resource depletion, climate change, and poverty – the threat from nuclear weapons is again growing.

In response to this situation, a new global campaign was launched in April 2007 by International Physicians for the Prevention of Nuclear War (IPPNW). Known as ICAN – the International Campaign to Abolish Nuclear weapons – it is calling for a 'Nuclear Weapons Convention' that would prohibit the development, production, testing, deployment, stockpiling, transfer, use or threat of use of nuclear weapons. This would be similar in structure to the existing Chemical and Biological Weapons Conventions. It would build on the 1968 nuclear Non-Proliferation Treaty (NPT), addressing both disarmament and non-proliferation – abolishing nuclear weapons, securing fissile materials and preventing their further production.

The UK wing of ICAN was set up earlier this year, co-ordinated by Medact. Its partners are listed in the box (above right) and include SGR.

### The case for a nuclear weapons convention

The case for a Nuclear Weapons Convention (NWC) is laid out in a report called *Securing Our Survival*<sup>2,3</sup>. This presents a draft model international treaty for the phased elimination of nuclear weapons

worldwide. The NWC cuts through the widely held perception that global nuclear disarmament is an unrealistic dream. It offers a vision of what a nuclear-weapon-free world might look like and provides a way for people to see how nuclear disarmament could actually take place, showing the practical steps that could lead to nuclear weapons being safely eliminated by all parties.

The model NWC contains detailed provisions for national implementation, reporting and verification, and the establishment of an international agency responsible for enforcement and dispute settlement. States that are parties to the Convention would be required to declare all nuclear weapons, nuclear material, nuclear facilities and nuclear weapon delivery vehicles they possess or control, and their locations.

The model Convention outlines five phases for the elimination of nuclear weapons:

1. taking nuclear weapons off 'alert' status (see p.1);
2. removing weapons from deployment;
3. removing nuclear warheads from their delivery vehicles;
4. disabling the warheads;
5. removing the fissile material and placing it under international control.

In the initial phases the US and Russia are required to make the deepest cuts in their nuclear arsenals.

Governments are the principal protagonists but civil society would play an important role. The scientific, medical, legal, and policy expertise of non-governmental organisations would make them key partners in the process. Also, some of the expertise of the scientists and engineers at nuclear weapons facilities would be needed to ensure the disarmament process was effective.

The model NWC does *not* undermine existing nuclear non-proliferation and disarmament regimes, and verification and compliance arrangements. It builds on the NPT, International Atomic Energy Agency safeguards, the international monitoring system of the Comprehensive Test Ban Treaty Organisation, and bilateral agreements between Russia and the United States.

### ICAN Partners in the UK

Abolition 2000 UK  
Campaign for Nuclear Disarmament  
Fellowship of Reconciliation  
Greenpeace UK  
Movement for Abolition of War  
Pax Christi British Section  
Scientists for Global Responsibility  
Women's International League for Peace and Freedom UK  
World Court Project UK

### The potential for progress

There is significant potential for progress. Some recent activities by political leaders and other influential figures give some cause for optimism. And once government attitudes change, a NWC could be achieved very quickly. The Partial Test Ban Treaty, for example, was concluded in 10 days of determined negotiation in July 1963 after years of deadlock.

The recent initiatives and statements on global nuclear disarmament have been wide ranging:

- In December 2006 at the UN General Assembly, 125 governments – including nuclear-armed China, India and Pakistan – called upon states to fulfil their nuclear disarmament obligations immediately *"by commencing multilateral negotiations leading to an early conclusion of a NWC"*.
- In two well-publicised letters in the Wall Street Journal (the second being in January this year), senior former US politicians George Shultz, William Perry, Henry Kissinger and Sam Nunn called for total abolition of nuclear weapons. This does seem to have influenced the presidential candidates, with both having subsequently made public comments supporting the goal of a "world without nuclear weapons", and Barack Obama making clear commitments to act if he is elected.<sup>4</sup>
- Also in January this year, during a visit to Delhi, Gordon Brown made this remarkable pledge, which was hardly reported in the UK: *"In the run-up to the Non-Proliferation Treaty review conference in 2010 we will be at the forefront of the international campaign to... ultimately achieve a world that is free from nuclear weapons."*<sup>5</sup>
- In June, Australian prime minister, Kevin Rudd announced the establishment of the Nuclear Non-Proliferation and Disarmament Commission, an international body that would build policy and political momentum towards the 2010 NPT review conference.

Opinion polls clearly demonstrate that a majority of citizens – including those of Nuclear Weapon States – also overwhelmingly want a nuclear-weapon-free future. So now is the time to deliver it.

## Action

Ask your MP to sign Early Day Motion 72 calling on the government “to work to achieve progress on multilateral negotiations with the aim of achieving implementation of a nuclear weapons convention by 2020”. To find your MP, go to [www.theyworkforyou.com](http://www.theyworkforyou.com)

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## Metrix Consortium members

### Training partners

QinetiQ  
AgustaWestland  
City & Guilds  
EDS  
Nord Anglia Education  
Raytheon  
Serco  
The Open University

### Estate partners

Land Securities Trillium  
Currie & Brown  
Dalkia  
Laing O'Rourke  
Sodexo

## The St Athan Defence Training Academy: the future of British education?

**Stuart Tannock discusses the disturbing implications of the Ministry of Defence's new multi-billion pound training academy.**

Britain's largest education and technology investment project in recent memory has been developing quietly under the public's radar. It is time we paid attention. In January 2007, the Ministry of Defence awarded an £11 billion contract to the private Metrix Consortium (see Box) to build a massive new training centre for the British armed forces at the village of St Athan in the Vale of Glamorgan, South Wales.

St Athan, which is expected to become one of the world's biggest military training establishments when it opens in 2013, will provide specialist training in engineering, communications and information systems technology to all three services of the British military. For the first time, it will centralise in one location military training that is currently done in sites across the country.

Supporters of St Athan emphasise that the Academy will use state-of-the-art technology and training methods such as neurolinguistic programming, e-learning technologies, computer-based training, computer-aided instruction, emulation, simulation and web-based systems. St Athan, they claim, “*breathes life into the classroom of the future model which for many years now has been anticipated by futurologists and thought leaders in the education community.*” St Athan represents a “*model for training in this country*” that will enable Britain to realise Lord Leitch's vision of gaining “*world leadership in skills.*”<sup>1</sup>

Why should any of this worry us? There is the fundamental question of why we should support such a massive outlay of taxpayer money on a military that is still involved in fighting an illegal war in Iraq – and in a country, Britain, that already boasts the world's second-largest military budget. Beyond this, St Athan represents three developments that should be attracting extended public and political debate, but that instead have received little attention, beyond a small, local campaign against the Academy that sprung up in Wales after the project was first announced.

First, St Athan is part of a political project of privatising the British armed forces, and turns over responsibility for military training to a private, for-profit consortium. At a time when, across the Atlantic, US Congress is holding investigations into abuses perpetrated by private military companies such as Blackwater in Iraq, Britain is rushing headlong down the same path of military privatisation that the USA has gone down before. This privatisation, moreover, makes the British government a direct partner of one of the world's largest and most controversial arms dealers, Raytheon, which is a core member of the St Athan Metrix Consortium.

Second, St Athan represents a major leap forward in Britain's participation in the global arms trade. The Metrix business model for maximising profits at St Athan is to maximise the amount of training it provides, through serving not just the British military but militaries from around the world. Between 2002 and 2005, the Ministry of Defence provided military training to more than 12,000 personnel from 137 countries, many with poor human rights records.<sup>2</sup> With St Athan, this trade promises only to increase.

Third, St Athan represents another step up in the ongoing militarisation of British education. The Open University – whose Vice-Chancellor, Brenda Gourley, claims that universities should be “*beacons that reflect the very best of which the human spirit is capable*”<sup>3</sup> – is a direct partner in the Metrix Consortium. Schools around the Vale of Glamorgan are making plans to train local youth for jobs at the St Athan Academy, while colleges and universities across South Wales, which have already been extensively militarised over the past decade, are exploring new Academy contract tie-ins.<sup>4</sup> Indeed, one reason why we shouldn't expect Cardiff University, the premier institution of research and learning in the region, to lead any critical investigation into the St Athan project is that, in 2005, it signed a long-term strategic research partnership with QinetiQ, another core member of the Metrix Consortium.

Promoters of the St Athan Defence Training Academy claim that it represents the future of education in Britain. Without public investigation, debate and critique of St Athan and other military research and education projects across the country, there is a strong possibility that this will come true. If it does, it will not be for the better of Britain or anywhere else in the world.

## Action

To find out more about the issue or to join the Stop the St Athan Academy campaign, see [www.cynefynywerin.org.uk](http://www.cynefynywerin.org.uk) or [www.no2militaryacademy.com](http://www.no2militaryacademy.com)

**Stuart Tannock was a visiting Research Fellow at the School of Social Sciences at Cardiff University from 2006-2008. He is a native of Toronto, Canada.**

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## Out of their depth? Uncertainties in nuclear waste management

**Rachel Western argues that the nuclear industry and the UK government are not properly considering the scientific evidence in their rush to 'solve' the problem of radioactive waste.**

### Early concerns

In the early days of the nuclear industry, the long term question of what would eventually be done with the fiercely carcinogenic by-products – the radioactive wastes – was not given much thought.

All that changed in 1976, when a report from the Royal Commission on Environmental Pollution (known as the 'Flowers Report') raised the alarm. It stated that: "...it would be morally wrong to commit future generations to the consequences of fission power on a massive scale unless it has been demonstrated beyond reasonable doubt that at least one method exists for the safe isolation of these wastes for the indefinite future" [emphasis added].<sup>1</sup>

However, within a couple of years the nuclear industry were confidently asserting that a deep-burial approach ('geological disposal') could be adopted, which would ensure that the wastes would be kept out of harm's way. It was thought that a series of barriers (such as the waste containers and the overlying rock) would provide a 'belt and braces' approach to safety.<sup>2</sup>

But when an initial review was carried out in 1985-86 the significance of the 'gas issue' was identified<sup>3</sup> – the issue being that, due to the eventual corrosion of the steel involved in the repository, a very large amount of hydrogen gas would be produced. This factor demanded that a gas release pathway had to be included in order to avoid over-pressurisation.

Thus the deep burial strategy that was proposed had an intrinsic design flaw: while at the same time as trying to hold in the wastes, there needed to be a route for the gas to escape. Hence the initial benchmark of 'isolation' had to be abandoned.

The supposition was that it would be possible to predict accurately the levels of contamination of the water that would seep from the burial facility back towards people at the surface. This is meant to show in advance that disposal would not be too risky – since if a burial facility leaked too much there would be little that could be done about it.

In 1991, the nuclear industry tested their capacity to make such predictions by carrying out experiments at a uranium mine in Brazil (the 'Pocos de Caldas'

Mine').<sup>4</sup> The uranium contamination level that was predicted was  $1.4 \times 10^{-11}$  milligrams per litre (mg/l). However, the contamination level that was actually measured was considerably higher:  $3 \times 10^{-3}$  mg/l. This meant the nuclear industry had under-estimated the contamination level by a factor of 200 million.<sup>5</sup>

Although such a large error range may seem extraordinary, it should be realised that the estimation of the solubility of a chemical element – without having accurate information on its chemical surroundings (particularly what else it is bonded to) – is liable to lead to wildly mistaken predictions.

In the mid-1990s the nuclear industry planned to start excavation work near Sellafield where they wished eventually to bury their radioactive waste. The plan was very controversial and so was subject to a public inquiry (which lasted from September 1995 to February 1996). During this inquiry the research on deep burial underwent extensive scrutiny.<sup>6</sup> Overall, the inquiry inspector concluded that the nuclear industry should not be given the go-ahead to begin their planned programme "in [their] current state of inadequate knowledge."<sup>7</sup> Hence the burial plans were shelved.

### The new drive for deep burial

Eleven years later, following work by a new advisory body, the Committee on Radioactive Waste Management, the government decided to push ahead with deep burial. Critically, this body did not examine the scientific reasons for the earlier rejection of disposal. The Department for Environment, Food and Rural Affairs (DEFRA) consequently published a white paper on the subject, stating that "*there is already sufficient research work available to be confident that geological disposal is technically achievable.*"<sup>8</sup>

In parallel with the launch of the white paper, the Nuclear Decommissioning Authority (NDA) – the body responsible for implementing radioactive waste disposal – published their Proposed Research and Development Strategy for consultation.<sup>9</sup> This document is also upbeat on the rigour of existing research, stating: "*There has been an extensive research programme over a number of years measuring the solubility of important radionuclides in the high pH and reducing environment of the geological disposal facility.*"<sup>10</sup>

However, a quick flick to the reference list of this document indicates that each of the three reports that this quote refers to pre-dates the 1995-96 inquiry – and its call for "considerably more" research.

So it appears that both the government and the nuclear industry are going try to ignore the inconvenient conclusions from the mid-1990s.

If a wrong decision were to be made about nuclear waste burial it could result in severe blight in the future and the possibility of an enormous bill for remediation (if remediation were actually to be possible). Yet, as is well-known, the nuclear industry is planning a new generation of power stations, backed by the government, while a huge legacy of existing waste remains to be dealt with. We should be heeding the advice of the Flowers Report and not going ahead with a new major nuclear programme before a method for the "safe isolation of the resultant wastes" has been established.

### Action

As mentioned above, the NDA are undertaking a consultation on their research programme – with a deadline of 30 November 2008. I am looking for people with expertise in any of the areas below to help challenge the NDA's arguments. In most cases, this will involve tracking the literature from the 1990s to the present and establishing which research areas remain to be addressed. Expertise sought: chemistry, geology, hydrogeology, engineering, and statistics.

**Dr Rachel Western has a background in nuclear waste science and policy. She has worked for the nuclear waste agency, Nirex, and Friends of the Earth**  
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Reducing carbon emissions from housing

Kate Macintosh outlines the environmental standards for new housing in the UK and argues that the bigger problems related to the quality of the existing housing stock are being neglected.

Official figures show that approximately 27% of UK carbon emissions are generated from energy use in homes<sup>1</sup>. One of the ways in which the government is trying to reduce these emissions is through a new set of codes for new housing. The current target is that, by 2016, all new homes built in England will be 'zero carbon'. However, in pursuing this target, the government is neglecting action to tackle the emissions of the existing housing stock, which will still make up the vast majority of housing for decades to come.

High standards for new housing

The Code for Sustainable Homes was introduced in 2007 and is intended to rate the sustainability of new homes in nine environmental impact categories, including energy and carbon dioxide, water, materials, ecology and waste. For energy and carbon dioxide, the Code ranges from levels 1 to 6, the latter being classified a zero carbon home. Table 1 gives the CO<sub>2</sub> emission standards for these six levels. The government plans that these levels will be phased in until, by 2016, all new homes built will be zero carbon.

Table 1 – CO<sub>2</sub> emission standards required by new building regulations<sup>2</sup>

	Reduction in CO <sub>2</sub> emissions <sup>a</sup>
Level 1	+10%
Level 2	+18%
Level 3	+25%
Level 4	+44%
Level 5	+100%
Level 6	+100% <sup>b</sup>

<sup>a</sup> Compared with the base level given in Part L of the 2006 Building Regulations.

<sup>b</sup> Additional measures are needed to qualify as a 'zero carbon' home.

Conformity with Level 3 requires triple glazing and heat recovery systems, while Level 4 will probably require the need for energy generation from renewable sources. At present only social housing is required to achieve Level 3. For other housing, this standard will not become mandatory until 2010, unless the local planning authority determines otherwise. The result is that there are varying

standards across the country, which can be confusing for developers and materials suppliers, making it more difficult for them to plan ahead.

The developer is obliged to provide Energy Performance Certificates, the assumption being that higher-rated new properties will fetch higher prices and the market will thus drive energy efficiency improvements. However, there are concerns that the current problems in the housing market might prevent this from happening to any great extent.

Measures for existing housing stock neglected

Many building professionals doubt that for above Level 4 the additional investment will be worth the improvement in energy performance. The same money invested in improving the existing building stock would arguably yield greater environmental and social benefits. Given that 85% of the existing housing stock will be standing in 2050<sup>3</sup> – judging by present trends – much greater focus is needed in this area.

There are many examples of the inadequacies in government policy in this area. New-build is subject to a zero VAT rate, while much improvement work is still levied at 17.5%. Incentives for many forms of home insulation are still relatively trivial. There is a lack of contractors with the necessary skills to install many energy efficiency or renewable energy technologies. The lack of effort to tackle the rise in air-conditioning – for example, by promoting alternatives such as greater use of window shading – is also a serious shortcoming.

New campaign

In order to tackle the inadequate government policy on the current housing stock and its contribution to climate change, a new coalition called the Existing Homes Alliance was formed in June. It consists of over 40 businesses, environmental groups and related organisations, including Federation of Master Builders, WWF, the Energy Saving Trust and the Association for Environmentally Conscious Building. SGR has also joined.

The Alliance has at its heart a declaration<sup>4</sup> that calls on the government to deliver:

- a strategy for delivering an 80% reduction in the carbon emissions of the housing sector by 2050;
- a timetable for regulation to improve energy efficiency standards;



- more financial incentives and services to help home owners, landlords etc. to invest in energy efficiency and renewable energy;
- training and related support to improve the skill levels in the buildings sector; and
- demonstration projects and supporting information campaigns.

If the government is serious about cutting carbon emissions, it must stop neglecting the contribution of the current housing stock. If it does not take serious action now, its targets for tackling climate change will simply not be met.

Kate Macintosh MBE Dip Arch was a partner in Finch-Macintosh Architects and is Vice-Chair of SGR.

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## Expanding renewable energy in the UK

Dave Andrews and Martin Quick give two perspectives on the potential for expanding the deployment of variable or intermittent renewable energy in the UK. In the first article (below), Andrews argues that the disadvantages of these types of technologies are much less than detractors claim while, in the second article (opposite), Quick outlines some innovative ways of expanding their deployment.

### Variable renewables and the base load issue

**Proponents of nuclear power stations often argue that this technology's ability to supply near-constant levels of electricity give it a clear advantage over, especially, variable or intermittent renewables, whose output varies according to local conditions. However, there are numerous reasons why this is not the case.**

#### The basics

Power stations connected to the national grid are generally classified as supplying 'base load' or 'peak load'. Base load is the minimum amount of electricity that is supplied during a 24 hour period, while peak load is the maximum.

Currently in the UK, base load is mainly provided by a combination of coal-fired and nuclear power stations. These plants take hours or days to start up and hence are utilised most effectively to supply this minimum continuous level of electricity (indeed, it is very hard to use these nuclear power stations in any other way), whereas plants that can start up much faster, e.g. gas-fired, are more suited to supplying peak load.

#### Dealing with variable renewables

Variable renewables obviously supply electricity according to their natural resource – the wind, sun, tides etc. Nuclear proponents often argue that, accordingly, variable renewables are 'ineffective' in providing base load electricity.<sup>1</sup>

Serious study suggests that this is incorrect. During, for example, a period of low winds, the electricity supply sector would do what it did in December 2007 – when many of the nuclear power stations in this country were out of action for various reasons – and simply start up existing gas- or coal-fired stations, which are held in readiness for this purpose.

Other techniques, all currently used to a greater or lesser extent in this country and around the world, routinely deal with the loss of power stations (planned or unplanned) or with power surges. These include:

- Load shedding – where large, non-urgent industrial consumers are automatically disconnected from the grid.
- Energy storage – common current examples include 'pumped storage' where excess

electricity is used to pump water back up into a reservoir serving a hydro-electric dam.

- Inter-country connection of power grids – used to redistribute electricity between countries (especially in Europe) in response to demand.
- Tariffs and 'smart' meters – these are increasingly being used to influence consumer consumption patterns.
- Privately-owned small diesel generators – there are very large numbers of small diesel generators in countries such as the UK and these can be called to help deal with the increased variability due to a large amount of (e.g.) wind power.

In fact, the largest potential cause of sudden power loss in the UK would be an emergency stoppage of the Sizewell B nuclear power station. Indeed, it is the size of that station – 1.2 gigawatts (GW) – that sets what is called the 'fast reserve generation margin' – the amount of electricity that would need to be brought online quickly to deal with such a power loss. Nuclear power stations – like all electricity plants – need back-up as they stop both in an emergency and for regularly for planned maintenance and/or re-fuelling.

#### The future

Obviously, the future development of the electricity supply system in the UK must be considered in the context of overall energy provision, subject to rapid reductions of greenhouse gas emissions and the maintenance of energy security. This has a range of implications given the discussion above.

Firstly, the rapid expansion of renewables should not be held up by the flawed arguments of the nuclear lobby. A recent Irish study has shown that close to 50% of electricity could be supplied to a national grid by wind energy.<sup>2</sup> A much more optimal approach would obviously be to complement wind power with other renewable energy generation (such as tidal, wave, biomass, and solar photo-voltaic) and energy storage, in tandem with a massive programme of energy-efficiency measures.

Secondly, we should construct many more combined heat and power (CHP) plants. These are considerably more efficient than conventional electricity supply plants (80-90% compared with 30-55%) since they divert their waste heat to supply local users. Such schemes are common throughout Denmark and

Germany. These can be built rapidly and, in particular, would help use natural gas much more efficiently given the current concerns over security of supply and cost. The flexibility of CHP plants mean they work very well in tandem with variable renewables.

Thirdly, there should be a large-scale expansion of interconnectors with mainland Europe to allow more efficient expansion of renewable energy across the continent.

Fourthly, we need to retain enough large, flexible, fossil-fuel power stations for managing peak demand, especially during infrequent periods of (e.g.) widespread low winds.

A recent study at University College London<sup>3</sup> has modelled in detail the yearly operation of the entire UK energy system hour by hour and claims that it would be technologically possible to provide up to 95% of power from a mix of renewables and CHP at a reasonable price of about 5 pence per kilowatt-hour (p/kWh).

So, should nuclear have a role in this future energy system? The fact that nuclear power stations need to run (almost) continuously at near their peak output raises serious questions about their compatibility with variable renewable energy technologies. If we want to have a large amount of renewable electricity, then the fewer large inflexible producers like nuclear, the better – the two types of technology are simply not a good mix.

**Dave Andrews is Secretary of the Claverton Energy Group, a UK organisation of 160 independent energy experts.**

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## Innovating to exploit variable renewables

**The limit of how much of the UK's energy could be provided by renewable sources depends on the size of the resources, their affordability and – for variable renewables – the ability of the grid to cope with a given degree of intermittency.**

### How much intermittency?

Recent research has shown the costs of integrating variable renewables into the grid to be quite modest for a contribution of up to 20% of the UK's electricity supply. For example, the UK Energy Research Centre,<sup>1</sup> following an analysis of a large number of international studies, showed that the extra cost of such a proportion would be 0.5 to 0.8 p/kWh, i.e. less than 1% on customers' electricity bills. Above this, more stand-by capacity would be needed to cope with periods of low electricity production. However, a wide geographic spread of wind and tidal power systems would minimise the likelihood of a very high proportion of these generators being unavailable at one time. Hence the amount of time this stand-by capacity would be called upon would be small, and the objectives of reducing carbon emissions and reducing dependence on imported fuels would not be seriously compromised.

This contrasts with the need for 'spinning reserve' – power stations operating at low power (and obviously using some fuel) – which is needed to respond rapidly to a sudden loss of generating capacity. The amount of spinning reserve is determined by the largest unit on the grid, currently the nuclear power station, Sizewell B.

### New technologies to harness a variable electricity supply

The potential to use higher proportions of variable or intermittent renewables on the grid could be substantially increased if greater use were to be made of energy storage technologies and controls that can switch off certain appliances and equipment at times of low supply.

In terms of energy storage, new possibilities arise from the use of electric vehicles and plug-in hybrid (PIH) vehicles. PIH vehicles have sufficient battery capacity to cover most typical daily journeys – with charging being mainly from the grid – together with an internal combustion engine for providing energy on longer distances between charging points. These plug-in vehicles could generally take their power at

times of surplus, e.g. at off-peak times when excess electricity is being generated by variable renewables. This would not only decrease the carbon emissions that such vehicles were responsible for, but also reduce costs due to the cheaper price of off-peak energy. In the very rare case of a prolonged shortage of (e.g.) wind-generated power, PIHs would be able to operate using their internal combustion engine. Some such vehicles are scheduled to be marketed soon.<sup>2</sup>

Another technology that could take advantage of a situation with a high proportion of renewable energy is the electric heat-pump. These pumps draw heat energy into a building from the external environment – mainly from the surrounding atmosphere (air-source heat pumps) or using pipes laid underground (ground-source heat pumps). Air-source pumps are generally cheaper, but ground-source tend to be more efficient, so the latter are generally preferred. Together with heat storage, these technologies could help make optimum use of variable renewables. Heat-pump and heat storage schemes become more economic if carried out on a community scale rather than just at the level of individual households. Indeed, with oil and gas prices likely to remain high for the foreseeable future, the economics of carefully designed heat-pump systems are becoming significantly more attractive.

### Exploiting the renewable potential

The UK has a very large potential for offshore wind power and different types of marine energy – and harnessing this potential could contribute energy far in excess of the 20% contribution discussed above. Floating wind turbines – which make use of well-developed technology for floating oil rigs and can be positioned in much deeper water than fixed turbines – are being developed and tested now by a number of firms.<sup>3</sup> Because of the stronger and more consistent wind in the open sea and easier installation (if grouped in large clusters to ease the electric connection to the shore), the cost of power from these is claimed to be comparable with onshore turbines. Hence, at present wholesale electricity prices, this would be a competitive electricity source. This development could provide very large amounts of energy in relation to the UK's needs.



Photo: (c) Greenpeace/ Davison

The UK government's recently released proposals for a renewable energy strategy<sup>4</sup> are an encouraging start for the medium term (up to ~2020), but to meet the very demanding greenhouse gas reductions needed in the longer term, preparations for an even larger programme of renewables is required, and this should include promoting demand-side infrastructure that can make optimum use of intermittent and variable renewables.

A huge effort to develop, manufacture and install a large capacity of renewables is needed urgently to tackle climate change, to ensure security of the UK's energy supply and to minimise economic problems due to an unfavourable balance of trade in energy. This will need a major upgrading of skills at all levels. But above all, there is a need to reduce energy demand through a combination of energy efficiency and behavioural change.

**Martin Quick is a chartered mechanical engineer with a background in the energy sector. He is also a member of SGR's National Co-ordinating Committee.**

Note: these issues are discussed more fully in a recent SGR submission to the House of Lords Economic Affairs Committee – available from <MartinQ@sgr.org.uk>

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High-alert nuclear weapons: the forgotten danger

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false warning (accidental nuclear war), the US and Russia continued to shorten the time required to launch their missiles. Because both nations feared a nuclear attack would destroy their command and control systems and silo-based forces, and because they also targeted each other's nuclear weapons, this created a strong bias for them to develop "... extremely rapid reactions to evidence of impending attack – in effect a launch-on-warning posture for both sides."<sup>11</sup>

Official denials

US officials have, in the past, acknowledged the US LoW capability,<sup>12</sup> but have never conceded that LoW is a fundamental part of US operational nuclear policy.<sup>13</sup> Russia also will not admit that LoW is central to its operational planning, although a former high-ranking officer who served in the Soviet General Staff has written that LoW still is a standard operating procedure in Russia's Strategic Rocket Force.<sup>14</sup>

Ironically, the US and Russia are also unwilling to publicly state that they will *not* employ LoW. It is arguable that a commitment by both nations to abandon LoW and substitute a policy of Retaliatory Launch Only After Detonation (RLOAD)<sup>15</sup> would eliminate the possibility of an accidental nuclear war based upon a false warning of attack. RLOAD would also prevent the launch of a nuclear retaliatory strike in the event of an attack with ICBMs armed with conventional warheads (that did not produce nuclear detonations).

Regardless of their refusal to admit or deny a reliance upon LoW policy (or even the possession of nuclear forces on high alert<sup>16</sup>), there is a clear historical record that both the US and Russia have developed and continue to maintain a LoW capability. There is expert testimony that they each can launch approximately one-third of their operational strategic nuclear weapons (most of their land-based ICBMs, along with some fraction of their submarine launched ballistic missiles) in a very few minutes.<sup>17</sup> Both the US and Russia also refuse to take a 'No First Use' pledge for their nuclear weapons.

Former Minuteman launch officer, Bruce Blair, states that, "*Both US and Russian intercontinental ballistic missiles remain fuelled, targeted, and waiting for a couple of computer signals to fire. They fly the instant they receive these signals, which can be sent with a*

*few keystrokes on a launch console.*"<sup>18</sup> Air Force General Eugene Habiger, a former head of the Strategic Command, told the Washington Post in 2007 that, "*...the natural state of an ICBM is on alert, with its nuclear warhead on and solid-fuel engines powered up.*"<sup>19</sup>

Past accidents and future risks

During the Cold War, the US-Soviet nuclear standoff was a political issue familiar to most Americans. However, after the fall of the Soviet Union, a lowering of tensions between the US and Russia (which obviously inherited Soviet weaponry) led to a rather remarkable American complacency about the danger posed by the continued existence of US and Russian nuclear arsenals.

In 1994, this false sense of security was fostered by a largely symbolic agreement between the US and Russia to remove the launch coordinates from, or 'de-target', their nuclear missiles.<sup>26</sup> Because it takes only about 10 seconds to re-install target coordinates during the launch process, the agreement created no meaningful change in the ability to launch strategic nuclear forces in a rapid fashion.<sup>27</sup>

On January 24, 1995, President Clinton told Congress that "not a single Russian missile is pointed at the children of America".<sup>28</sup> Only hours later, a Norwegian weather rocket (Black Brant XII) was mistakenly identified by the Russian early warning system to be a hostile incoming ballistic missile.<sup>29</sup>

The warning apparently was passed up the entire Russian chain of command and reportedly resulted in the opening of the 'nuclear briefcases' carried by the Russian President, Defence Minister and the Chief of the General Staff. These briefcases are designed to facilitate the rapid transmission of the 'permission order' to launch Russian nuclear forces.

According to numerous published accounts, the false warning caused the President to open his briefcase for the first time. The buttons in the suitcase probably gave him a range of nuclear strike options against all strategic targets, including the US and Western Europe.<sup>30</sup>

The electronic display on the nuclear briefcase indicated a possible US or NATO nuclear missile launched from Norway or the Norwegian Sea. The President tracked the missile on the screen for three

Tables 1, 2 and 3 give estimates of the current size of the high-alert nuclear forces in the US and Russia. The weapons yield (explosive power) is given in megatons (MT) of TNT equivalent.

Table 1 - US high-alert forces<sup>20</sup>

	Missile numbers	Warhead numbers	Total yield (MT)
Land <sup>a</sup>	464	726	206
Sea <sup>b</sup>	96	576	109
Totals	560	1302	315

<sup>a</sup> ICBMs: 95% assumed alert rate<sup>21</sup>  
<sup>b</sup> Submarine launched ballistic missiles (SLBMs): 4 US Trident submarines always kept at "hard-alert" (in position to fire) with 24 missiles per submarine x 6 warheads per missile (100% assumed alert rate)

Table 2 - Russian high-alert forces<sup>22</sup>

	Missile numbers	Warhead numbers	Total yield (MT)
Land			
SS-18s <sup>c</sup>	60	600	450
SS-19s <sup>d</sup>	67	402	302
SS-25s <sup>e</sup>	181	181	100
Sea <sup>f</sup>	32	96	18
Totals	340	1279	870 <sup>g</sup>

<sup>c</sup> 80% assumed alert rate<sup>23</sup>; 10 warheads per missile; 750 kT yield per warhead  
<sup>d</sup> 67% assumed alert rate<sup>24</sup>; 6 warheads per missile; 750 kT yield per warhead  
<sup>e</sup> Assume 90% alert rate; 1 warhead per missile; 550 kT yield per warhead  
<sup>f</sup> SLBMs: 5 Delta-III and 6 Delta-IV submarines; total of 176 SLBMs; 3 to 4 warheads per missile; 624 total warheads. Russia does not run continuous ballistic missile submarine patrols as the US does, thus most Russian submarines remain in port. Assume at least 2 submarines on alert, thus 32 missiles with (minimum) 96 warheads, and total yield of 18 MT.  
<sup>g</sup> If all the missiles on Russian submarines were considered on high alert, then the total yield would be 938 MT.

Table 3 - Total high-alert forces

	Missile numbers	Warhead numbers	Total yield (MT)
USA	560	1302	315
Russia	340	1279	870
Total	900	2581	1185 <sup>h</sup>

<sup>h</sup> Total yield of US and Russian operational nuclear arsenals is approximately 2657 MT<sup>25</sup>, thus about 45% of the yield is on high alert.



to seven minutes before it became clear that the missile was not headed towards Russia.<sup>31</sup> Russian nuclear forces were then ordered to return to watch duty. Under Launch-on-Warning protocol, he was within a few minutes of a launch decision.

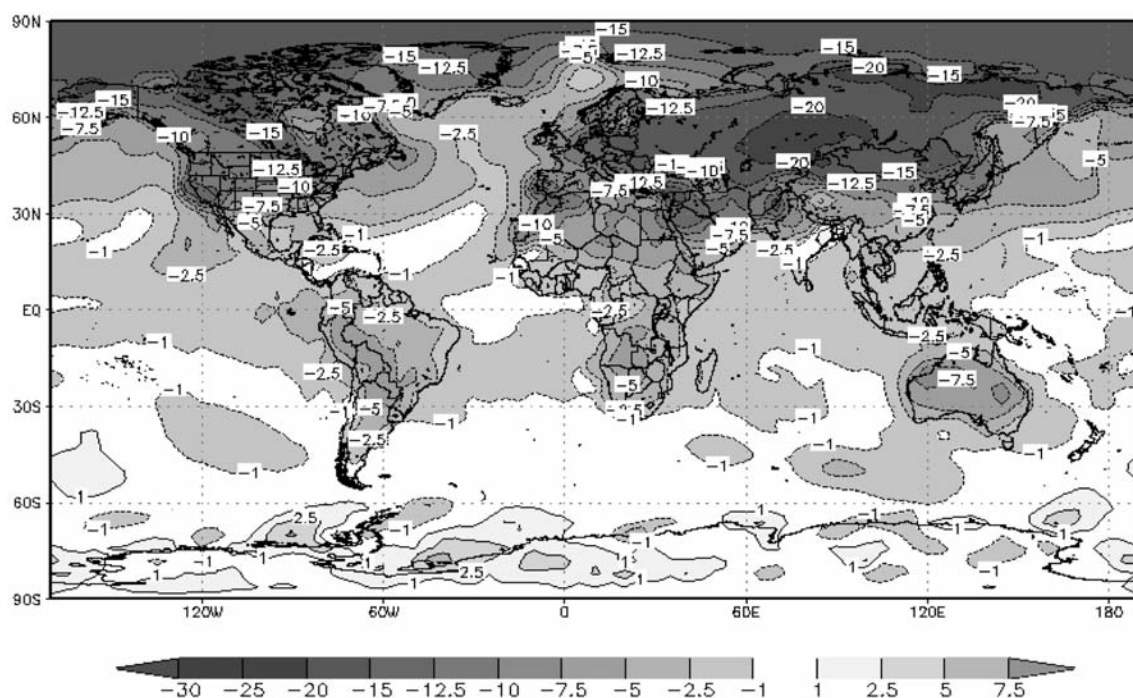
Had this incident occurred during a period of increased tensions between the US and Russia, one wonders if the outcome would have been the same. Regardless, the 1995 Russian false warning of a US/NATO nuclear attack clearly illustrates the potential danger of an accidental nuclear war made possible by the existence of hundreds of high-alert ICBMs.

Neither the US nor Russia will disclose the number of false alerts experienced by their early warning systems. In 1985, the US began classifying this information, although it had previously admitted to many significant false warnings, a number of which had led to the full alert of US nuclear forces and threat assessment conferences involving the Joint Chiefs of Staff.<sup>32</sup>

While it is possible to cloak these events in secrecy, it is not possible to prevent the events themselves. As long as the US and Russia maintain LoW capability and a *de facto* LoW policy, the possibility remains of a false warning triggering a retaliatory nuclear attack and an accidental nuclear war. Excessive secrecy, however, does preclude informed debate and keeps the public unaware that such problems even exist.

The possible causes of a false warning are no longer restricted to failures of hardware, software or human judgement. Deliberate acts of individual or state-sponsored terrorism must now be factored into this most dangerous equation.

Such acts could include spoofing radar or satellite sensors of early warning systems, the penetration of nuclear command and control computer networks, and the introduction of viruses or software that would mimic a full-scale nuclear attack into early warning system computers.<sup>33</sup> Also, if terrorists obtained permission codes required to launch nuclear weapons and then obtained access to the command



**Figure 1 – Temperature changes in summer (°C) following large nuclear war<sup>41</sup>**

*Predicted surface air temperature changes following a nuclear war that caused 50 million tons of smoke to rise into the stratosphere, above cloud level, and massively block sunlight from reaching the Earth. Temperatures are averaged for June, July, and August of the year of the smoke injection.*

and control systems, or took physical control of a nuclear weapon (e.g. a road-mobile Russia SS-25), they would be able to launch the weapon(s).

## The consequences of a war involving high-alert nuclear weapons

General knowledge of nuclear weapon effects is also sadly lacking. Most people have no idea that the detonation of a single average strategic nuclear weapon will ignite a gigantic firestorm over a total area of 105 to 170 square kilometres.<sup>34</sup> Even fewer people are aware of the predicted environmental and ecological consequences of nuclear conflict.

As discussed in the previous *SGR Newsletter*,<sup>35</sup> recent research using NASA climate models forecasts that even a 'regional' nuclear war, using 100 Hiroshima-sized nuclear weapons, would result in catastrophic disruptions of the global climate.<sup>36</sup> Burning cities would produce about five million of tons of smoke that would rise above cloud level to form a global stratospheric smoke layer. This would block sunlight, leading to rapid drops in global surface temperature and significant reductions in global precipitation.

Furthermore, research published in April 2008 indicated that smoke from this regional conflict would

also destroy 25-40% of the protective ozone layer over the populated mid-latitudes, and 50-70% of the ozone over the more northerly latitudes.<sup>37</sup> Such reductions would enormously increase the amount of ultraviolet light reaching the surface and have serious consequences for humans and many other forms of life. The levels of ozone destruction predicted by this new study had previously only been expected to happen after a full-scale nuclear war.<sup>38</sup> Unfortunately, no new studies have been carried out using a modern climate model that could estimate the amount of ozone that would be destroyed by a major nuclear conflict, but it seems reasonable to expect that it could be significantly larger.

In 2007, US scientists predicted that a nuclear war fought with about one-third of the global nuclear arsenal<sup>39</sup> would cause 50 million tons of smoke to reach the stratosphere – about ten times that of a regional war. The resulting 'nuclear darkness' would cause average global surface temperatures to become as cold as those experienced 18,000 years ago during the coldest period of the last ice age<sup>40</sup> – see Figure 1.

The US and Russian strategic nuclear arsenals on high alert contain a total explosive power of nearly 1,200 MT, with the total explosive power of the

operational, deployed nuclear arsenals of both countries being nearly 2,700 MT (see Table 3). Based on the new climate studies, a nuclear war between these two nations, which began with the detonation of their high-alert, launch-ready nuclear arsenals, and went on to include about another 20% of their deployed nuclear arsenals, would – at minimum – result in the extreme level of climate change shown in Figure 1.

Computer models predict that 40% of the smoke would still remain in the stratosphere 10 years after the nuclear war, causing a long-term nuclear darkness. The subsequent cooling of the Earth's surface would weaken the global hydrological cycle and lead to significant decreases in average global precipitation.<sup>42</sup> Growing seasons would be drastically shortened throughout the world, particularly in the large agricultural regions of the Northern Hemisphere. Under such circumstances, most people on Earth would starve.<sup>43</sup>

In addition to the catastrophic effects on the climate and ozone layer, a nuclear war would release enormous amounts of radioactive fallout, pyrotoxins and toxic industrial chemicals into the environment. Taken together, these would be a clear threat to the continued survival of humans and other complex forms of life.

The scientists who carried out the research on the climatic consequences of nuclear war state that a nuclear first-strike would be suicidal, and have called for a new global nuclear environmental treaty.<sup>44</sup>

## Taking nuclear weapons off high alert

High-alert nuclear arsenals are being challenged by a number of signatories to the nuclear Non-Proliferation Treaty. In 2007, New Zealand, Sweden, Switzerland, Chile and Nigeria sponsored Resolution L29 (GA62/36) calling for the elimination of all nuclear weapons from high-alert status, which was approved by the UN General Assembly on a vote of 136 to 3. The only three nations voting against the measure were the US, the UK and France.

The United States and Russia should look upon this as an opportunity to act "in good faith"<sup>45</sup> to end the inexcusable danger of accidental nuclear war created by their thousands of high-alert, launch-ready nuclear weapons. Should they choose to work together with the non-nuclear weapon states and stand down their nuclear arsenals, they would finally end their Cold War nuclear confrontation and truly begin the path towards the abolition of nuclear weapons.

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**This article is based on material presented at a side event at the 2008 PrepCom of the nuclear Non-Proliferation Treaty (NPT).**

**Dedicated to the memory of Alan Phillips of Physicians for Global Survival, Canada.**

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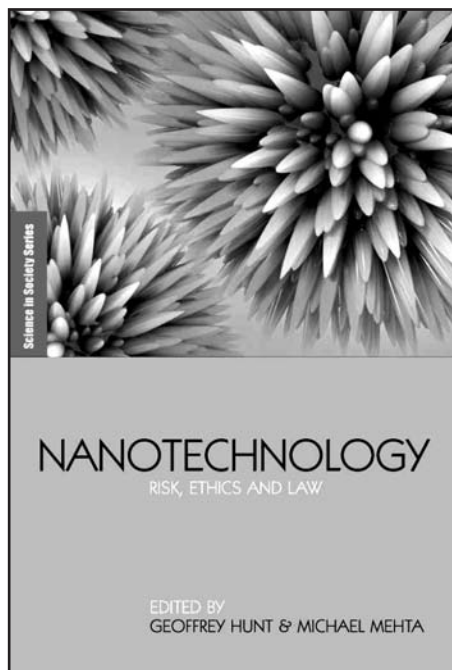
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## Nanotechnology: risk, ethics and law

Geoffrey Hunt, Michael D Mehta (editors)

Earthscan, 2006, £49.95, 296 + xxiii pp., ISBN 978 1 84407 358 0 (hardback)



Nanotechnology is a relatively new field of research and development; it is well funded and said to have a bright future. Much is made of its potential to solve world problems, but a vocal minority warns that without control and oversight nanotechnology could have disastrous consequences. This book "*explore[s] the risks and benefits of nano-derived processes and products*" (p. xvi). It has five parts – the first two introduce nanotechnology, and then look at regional developments (in Japan, the USA, Europe and Canada). The next three parts address the risk, ethics and legal aspects signalled in the title. The risks concern the actual risks to health, safety and the environment that arise mainly as a result of the tiny size of the particles and our ignorance of how these particles may affect our bodies and other organisms in our environment. The ethical issues include the possible impact on the rest of the world that a developing nanotechnology may have, especially on the distribution of wealth. Finally the law involved is really law in the making – we can only make informed guesses about the impact that nanotechnology may have on health, environment or economics and yet there is a felt need for laws to protect us from the dangers of such impact.

In my estimate the papers in this book (22 in all) will continue to be relevant for some time. The book is specifically about nanotechnology, but much of what

it has to say regarding wider social implications is relevant to any new or emerging technology. Indeed there is an underlying optimism in the book that, with developing social and political awareness of the social impact of new technologies, nanotechnology may contribute to social welfare. Indeed, some contributors see nanotechnology as a turning point in social awareness and social control of new technology.

The book provides a brief account of the areas of research and professional affiliations of each of the 29 contributing authors. This was very helpful in understanding the point of view from which the papers were written.

My favourite section was 'Regional Developments', which reports on the ethical views of, and (changing) attitudes towards, nanotechnology in four world regions: Japan, the USA, Europe and Canada. The contrast between US freedom (some might say recklessness) in developing and marketing new technologies, and the European precautionary approach, is fairly well known; but the Canadian concern with social benefits of new technology was new to me, as was the growing influence in Japan of NGOs and the responsiveness of the Japanese government to their ethical and environmental concerns.

Research on the health and safety aspects of nanotechnology is still in its early days, and the book's papers on this topic provide a good jumping-off point for those who want to dive further into this growing and increasingly technical field of nanotechnology risk. Somewhat alarming is the fact that, while the toxicology studies are still only getting started, "*thousands of tons of nanomaterials are already being produced each year*" (p. 132).

The section on 'Ethics and Public Understanding' is relatively short but highlights a theme that runs through the book – the need to look at the social and economic impact of this technology and how it will be accepted (or not) by the public. One of the editors, Hunt, is a professor of ethics and global policies and founder of the public accountability NGO 'Freedom to care'. The other, Mehta, is a professor of sociology specialising in science, technology and society. Hunt's contribution to this section places nanotechnology in the context of global ethics –

addressing economic injustice, war, environmental degradation, and over consumption. The next paper in the section draws on, among other things, the landmark 2004 Royal Society and Royal Academy of Engineering report *Nanoscience and Nanotechnologies*, to highlight the importance of engaging with the public in developing this technology. The final paper in this section confronts the spectre of GM food – pointing out the dangers industry faces when, in its pursuit of profit, it attempts to ride roughshod over public sensibilities.

This book is optimistic, at least hopeful, that nanotechnology will respond to public scrutiny and direction, that the business community will see the commercial dangers of flouting public opinion. The public reaction against the misguided corporate rush to capitalise on GM technology is seen as the danger facing a nanotechnology that does not meaningfully engage with the public. Given the growing awareness in the science and technology community of the power of public concern, there is good reason to hope that there will be proper public engagement so that this new technology will realise its potential to benefit the global community.

**Richard Jennings**  
University of Cambridge

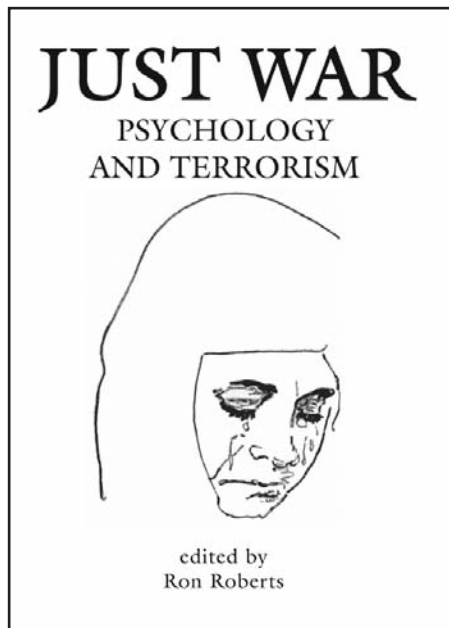
The paperback edition (ISBN: 978 1 84407 583 6) is now available, priced £24.95.



## Just war: psychology and terrorism

Ron Roberts (Editor)

PCCS Books, 2007, 257 + xiv pp., £20.00, ISBN 978 1 898 05992 9 (paperback)



*Just War* is a deeply disturbing, meticulously referenced and well written book. The twelve essays that comprise this slim volume are wide-ranging, and passionately crafted by psychologists and social scientists, many of whom are active in helping the victims of violence. Several of the contributors are also activists, seeking ways of challenging militarism. Such in-depth expertise is immensely useful for an understanding of violence, its seeming acceptance by many, and the sustained rise of militarism today.

The 'War on Terror' is used as the focal point for many of the contributions, which include: descriptions and discussions of the role of psychology in finding ever more inhumane ways of interrogation; analysis of the language used by Bush and Blair to 'explain' the illegal invasion of Iraq and the subsequent chaos; the rationale and world-views of those espousing politically-motivated acts of violence; and, perhaps the most disturbing, a history of the silence of the professional bodies representing psychology and allied disciplines in condemning torture and violent interrogation.

Despite the range of topics covered, the overarching theme that runs through the whole collection is power, violence and the complex and mutually supporting construction of 'reality', which itself supports that power. Contributors describe for us, in clear and well constructed language, the means and

ways in which 'reality' is constructed. It is a process that depends upon a host of factors, including the cultural, historical, economic, political, ideological and religious. Power is supported in diverse ways and is deeply embedded in society. Clear descriptions are provided by several essays, which draw upon a variety of data to describe the range of methods used by governments to render violence acceptable to us and how the curtailment of liberty is justified as a means of countering the perceived terrorist threat.

A major strength of the essays in *Just War* is that they not only describe processes but provide the reader with powerful tools to question the prevailing view of war and conflict and, most importantly, to challenge the inexorable rise of militarism globally.

Several of the essays (for example: 'Relational Psychology in the War Speeches of Bush and Blair: Beyond Us and Them' and 'Power, Illusion and Control: Families, States and Conflict') show how we and the media construct an 'us' and 'them' dichotomy that provides a set of psychological mechanisms justifying the use of violence. It is essential in such a Manichean view of the world, to project 'bad' onto the 'enemy', whoever they may be; and mandatory to deny that this is a projection (p. 165). Mechanisms such as this help to blind us to a more complex and objective understanding of politically-motivated violence. In particular, it makes it easier to condone torture and harmful methods of interrogation when these are supposedly necessary for security reasons, despite humanitarian law forbidding such acts. The Iraq and Afghanistan adventures and the methods of interrogation and torture used at Abu Ghraib and Guantanamo owe a great deal to the research, supported by the military, and undertaken by psychologists and those in related disciplines. Torture remains part of the military arsenal despite the lack of objective evidence that it provides reliable information.

Several essays in *Just War* show how a detailed deconstruction of the language used to describe the events of the Iraq War help us to see the reality of war and the suffering of civilians in ways which the media, Bush and Blair in their speeches deliberately air-brush out from the lived reality.

Although in such a powerful set of essays it is invidious to make mention of specific contributions, I

found those by David Harper (on the complicity of psychology in the security state); Nimisha Patel (on torture, psychology and the 'War on Terror'); and Ron Roberts (on power, illusion and control, as well as his brilliant account of sleepwalking into totalitarianism) to be especially thought-provoking and challenging.

The scope of the discussion and detail used by all the writers is most impressive and the book should be read by scientists from within and outside psychology and the social sciences in order both to understand the role of these disciplines in warfare and, more importantly, to contest the use of psychology and related sciences to support militarism.

It is vital, as scientists and those who use objective means of understanding the world, that we rely upon the most effective means to ensure peace and security rather than rely on propaganda and demonisation. As Einstein said: "*I happen to think highly enough of [hu]mankind to believe the spectre of war would long have disappeared had the sound common sense of the people not been systematically corrupted by commercial and political interests operating through the schools and the press.*" (Quoted on p. 214)

Sadly this corruption continues, but this passionate and scholarly collection shows us how the ethically motivated, with the right tools, can tease apart our reliance on offensive means to address security and so build a more peaceful world.

**Chris Langley**  
**Scientists for Global Responsibility**

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## Fuelling the future – reducing the emissions of passenger cars in the UK by 2020

Royal Society of Chemistry, November 2007, 10 pp. (summary report)

The report, *Fuelling the Future*, begins by pointing out that any improvements in the efficiency of cars are being more than offset by increased vehicle mileages. Thus, for road transport to contribute proportionately to the UK and EU carbon dioxide reduction targets, there will need to be changes in the way people use cars as well as significant improvements in vehicle efficiency and take-up of low carbon energy sources.

Passenger cars contribute just over half of the 23% of the UK's CO<sub>2</sub> emissions that are caused by road transport. The average CO<sub>2</sub> emission rate of new cars in 2006 was 168 grams per kilometre (g/km), while the European Commission has proposed a target of 120g/km by 2012. This report says that greater improvements are possible and should be targeted. It points out that there are issues of consumer acceptance to be overcome in achieving a change to more economical (and therefore, most likely, smaller) vehicles.

The report notes the need for more efficient engines, lighter materials to reduce vehicle weight (without

compromising safety), improved aerodynamics, and more efficient electrical systems and auxiliaries.

It also argues that there is a need to develop and bring to market second generation biofuels – those which can be made from all parts of the biomass, not just oils, starches and sugars as with first generation biofuels. This will, the report argues, enable biofuels production to increase without directly competing with food crops. It is proposed that requirements for the proportion of biofuels in motor fuel should be based on overall CO<sub>2</sub> reductions and 'well-to-wheel' efficiency, rather than by the proportion by volume as in current UK legislation. The report does not discuss whether biofuels from algae will be a viable option, perhaps because it does not expect significant progress before 2020.

The report suggests that hybrid vehicles (i.e. those with an internal combustion engine and an electric motor) should have a growing market share, reflecting their potential for efficiency gains. However, it recognises that the uptake for these vehicles, and even more, that of fully electric vehicles, depends on

significant improvements in battery technology and reductions in cost. It suggests that plug-in hybrids, where the battery can be additionally charged from the mains with sufficient energy to cover the needs of most daily use cycles, have significant potential in the mid-to-longer term. Both plug-in hybrids and electric vehicles could give major CO<sub>2</sub> reductions, especially if a high proportion of the electricity comes from renewable sources. One particular benefit in charging a large number of electric vehicles via the national grid is that it could use excess supply from variable renewables like wind, solar, tidal, etc., when demand was low. (Although, of course, charging would have to be interrupted at times of peak demand elsewhere on the grid.) This could be particularly relevant if, as the government has recently proposed, the UK could build about 30 gigawatts of off-shore wind turbines.

The report asks the question, "*Hydrogen – should the investment be made?*" It says the 'hydrogen economy' is unlikely to develop without political support in the form of subsidies, and support for large-scale R&D. Given that there has been a large programme of research for many years, and the problems remain of on-vehicle storage, energy losses in pressurisation to 700bar or cryogenic liquefaction to -253°C, the continuing high costs of fuel cells, and the huge costs of a whole new infrastructure, perhaps the report authors could have come off the fence and given an answer to the question!

An interesting concept now being given some attention, but not mentioned in this report, is methanol fuel. This can be made from biofuels more readily than ethanol, or synthesised from CO<sub>2</sub> from power station flue gas and hydrogen. If the hydrogen is made with renewable energy, a nearly CO<sub>2</sub>-neutral energy cycle would result, with a high-performance fuel that can be used in conventional engines and that is much more readily integrated into the supply system than hydrogen.

Overall, this is a useful report, even if it doesn't say anything radically new, but it is not clear how much notice of expert advice the government takes!

**Martin Quick, Scientists for Global Responsibility**

Available to download at:  
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## Trident: the deal isn't done

Nick Ritchie

Bradford Disarmament Research Centre, December 2007, 16 pp

Indeed it is not. Nick Ritchie looks at both the practical process towards the Trident (Vanguard-class) submarine renewal and the political issues involved. He concludes that the renewal decision is not certain and that this is as it should be. His paper is the first in a series that will be published at the University of Bradford. It predates the recent speeches by Gordon Brown in Delhi and Des Browne at the Conference on Disarmament in Geneva that showed the stark inconsistency between Britain's supposed desire to support nuclear disarmament initiatives and its plan to maintain its own so-called nuclear deterrent beyond 2050.

Ritchie argues that the March 2007 parliamentary decision is neither final nor binding and lists a number of outstanding technical problems, as well as the global question as to the usefulness of such weaponry in today's world. He points out that 'deterrent' alternatives to Trident, if needed, exist in non-nuclear formats. He shows that Britain neither needs nuclear weapons nor can use them even as a believable threat. He refutes the 'last ditch' (Bevanite) argument that possession of nuclear weapons is essential to world status, including permanent membership of the UN Security Council. If replacing Trident is the answer, says he, what is the question? We await the reply.

Others have published much longer surveys of these questions, but for those who need a succinct analysis to prime themselves for argument or discussion with MPs this will do very well. Download and study.

Peter Nicholls, University of Essex

Available to download from:  
<http://www.brad.ac.uk/acad/bdrc/nuclear/trident/trident.html>

## GM contamination – imports of food and feed at risk: measures needed to reduce the threat

Rachel Dechenne, Pete Riley

GM Freeze, May 2007, 12pp

In seven pages of text and four pages of world maps, this pamphlet assesses and illustrates the risks the UK faces of importing food and feed contaminated by genetically modified products. The dangers of contamination are sharply increased by recent developments in 'pharming', the production of pharmaceuticals in GM food crops. Using information from the Department of Environment, Food and Rural Affairs, the report identifies which crops imported into the UK are at the highest risk of GM contamination, and from which countries these imports come.

The authors recommend a number of measures that should be put in place to protect the UK (and Europe) from accidental contamination by such crops, and call for tighter regulation of food and feed imports to reduce the risk of GM contamination.

Recommendations include:

- the establishment of a single competent authority in each member state for GM monitoring of incoming food, feed and biofuel cargoes and enforcement of GMO traceability and labelling.
- a legal obligation on biotechnology companies to provide analytical methods and reference materials for all the GM traits they have released anywhere commercially or experimentally as a pre-condition for receiving marketing or experimental consent for a GMO in the EU.
- strict liability on biotechnology companies whose GM traits cause contamination for harm to health and the environment or cause economic damage.

Further recommendations include a new clause in the Cartagena Biosafety Protocol "*to establish an international register of GM traits for all crops which are being field tested or commercially grown anywhere on the planet*"; and a ban on the production of pharmaceuticals in GM food crops.

The regulations called for seem eminently sensible, and would help to overcome the FSA's failure to take the problem of GM pollution seriously.

Richard Jennings, University of Cambridge

Available from: GM Freeze, 94 White Lion Street, London N1 9PF;  
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**Letters to the Editor should be sent to <[newsletter@sgr.org.uk](mailto:newsletter@sgr.org.uk)>. They may be edited for brevity or clarity.**

### **Another tip for eco-friendly washing**

Further to Alan Cottey's excellent article 'The CO<sub>2</sub> and H<sub>2</sub>O Costs of Bathing', (SGR Newsletter 35) there is also the 'stand-up wash-shower'. Turn the shower on for about 10 seconds to wet the body. Then switch the shower off while soaping. Another 50 to 70 seconds of the shower is used to rinse off.

Also, if you put in the plug before you start, the waste water can be used to flush the toilet.

**Dr Jill Harvey, Redhill, Surrey**

### **More trees to tackle climate change?**

Are the campaigns to reduce the carbon dioxide emissions from aircraft, motor cars, power stations and other industries likely to be effective in reducing climate warming?

The level of carbon dioxide in the atmosphere is already so high as to cause the melting of the Earth's ice caps and other adverse effects, so a reduction in emissions will not turn the clock back. Surely what mankind must do is to put the carbon from fossil fuels back where it came from, i.e. into vegetation. The deserts of the Middle East and North Africa, where there are oil fields, must originally have been lush green areas. Can we not have a massive programme to get the photosynthesis going in these areas plus others such as Australia?

It may appear simple fantasy to expect vegetation to grow in such inhospitable areas, but I ask scientists in SGR to give it serious consideration. I am told that it is possible to grow certain grasses in sandy soil; once this is established other vegetation can follow. Of course such a project would require massive international effort at many levels, e.g. irrigation and much more – but then the problem is a massive international one.

In any case, mankind urgently needs more vegetation to provide food for an increasing population. Starvation is yet another motive for this international effort.

Can I ask scientists in SGR who have expertise in agriculture, forestry, climatology, engineering, etc. to apply their minds in a positive way to this proposal?

**Bernard R Bligh, Hampton Hill, Middlesex**

## **Call for SGR Conference Poster Presentations**

**The 2008 SGR Annual Conference will be held on Saturday 25 October at Baxter and Associates' Gallery, Farringdon, London EC1**

The theme of the conference is sustainable building and communities: their role in meeting environmental and social goals. The main speakers will be Kate Macintosh MBE Dip Arch, Scientists for Global Responsibility, and Professor Sandy Halliday, Gaia Research, Edinburgh. The conference will also include a poster session.

**If you wish to apply to present a poster, please send a brief description (not more than 100 words) to [AlanC@sgr.org.uk](mailto:AlanC@sgr.org.uk) by 30 September (and earlier if possible).**

Posters on any subject within SGR's remit (see <http://www.sgr.org.uk/Constitution.html>) are acceptable but it is expected that most will be on the conference theme.

All members will be receiving full details about the event shortly - in the meantime, please see <http://www.sgr.org.uk/conferences.html> for the latest information.



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Emma Thompson

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