

FRIENDS OF THE SCOTSMAN / Health and science

A power of work needed to keep the UK's lights on

Educing the young on our energy needs is vital argues **Stephen Breslin**

Last Wednesday most of us will have arrived home from work and flicked on the lights and made a cup of tea as usual without realising that the only reason we could do this was because the National Grid was using new measures to keep the power on.

For the first time a new tool to balance the energy system, Demand Side Balancing Reserve (DSBR), was used to help manage the peak demand time between 5pm and 6pm, when families start to get home and cook dinner, but offices and factories are still open. This involved a small number of contracted large businesses being asked, under a commercial arrangement, to cut their electricity use.

The power shortage was caused by a number of factors including unexpected maintenance issues at ageing coal-power stations, which led to temporary shut-downs at several power plants; low wind speeds, meaning wind farms were only able to produce 1 per cent of the UK's required electricity, and no solar input, because the requirement happened when it was dark.

National Grid is clear that these measures are one of their many tools used to maintain a significant buffer of reserve power and that we were never moments from being plunged into darkness. Nevertheless, the need for these measures should focus our thoughts on addressing our future energy requirements.

Although this is the first time that this has occurred in the last three years it must act as a wake-up call to the public to help them understand the importance of planning ahead.

In order to find solutions to meeting our future power needs, there has to be a greater understanding of the issues of energy generation. This requires a new wave of young people to be inspired to consider their role in ensuring future generations have sustainable power sources. If nothing is done, matching supply and demand will only become more challenging as old coal power stations close and gas generators are mothballed.

The Powering the Future exhibition, based at Glasgow Science Centre, is the most ambitious exhibition ever mounted in the UK tackling the topic of energy use.

With the aim of giving the public unbiased information, the project, which has the support of the UK and Scottish Governments, hopes to increase the number of young people entering science technology engineering and mathematics (STEM) based studies and careers.

● **Dr Stephen Breslin is chief executive of Glasgow Science Centre. The centre's £1.5m Powering the Future exhibition opens on 10 December.**

Real concerns over ability to edit a human life



Changing genes may help fight disease but ethical questions worry scientific community, says **Calum MacKellar**

Since the entire genetic code of a human being was deciphered in 2003, scientists have been in possession of the genetic instructions for every component of every cell in the body. But within these instructions, errors or changes to genes may arise which can result in serious health disorders. Despite being aware of these mistakes, there was no easy way to edit and address these genetic errors until 2013, when a group of scientists in California discovered the CRISPR (clustered regularly interspaced short palindromic repeats) technique. The procedure acts like a pair of molecular scissors with a sort of satnav which guides the scissors to cut or replace genetic material at a precise point in a gene. Because of this, it is called gene editing and is easier, cheaper and more realistic than ever before.

The image of a future where cancer can be cured by a course of drugs, Alzheimer's can be easily prevented and genetic diseases can essentially be bred out of society is naturally appealing. So why are scientists even hesitating in making this image a reality by employing a technology like CRISPR? Does society not have a responsibility to humankind to use this new discovery immediately?

In order to answer these questions, it should be noted that there are serious safety, ethical and philosophical concerns why a technology like CRISPR, which makes genetic changes to human beings, needs to be approached with caution.

Though it may be easier to use and more precise than previous gene editing techniques, it is still far from perfect. One of CRISPR's present limitations is that the wrong part of the gene may be edited. This was highlighted in April this year when Chinese gene-function researcher Junju Huang used CRISPR to edit the genetic makeup of 86 human embryos. Of the 71 embryos that

survived the experiment, 54 were tested revealing that only 28 were successfully edited, and only a fraction of these contained the replacement genetic material. The experiment confirmed the doubts of many scientific observers – CRISPR is not yet ready to be used for human application.

In fact, Jennifer Doudna, the American scientist credited with CRISPR's discovery, has publicly called for a moratorium on some uses of the technology, stating she feels that it is "critical to initiate a public discussion of the appropriate use of this technology" and to call for a voluntary ban on human inheritable gene editing for clinical applications at the present time.

There are others who want to take this message a step further and prevent technology like CRISPR from ever being used on humans. Altering the human genetic heritage is not only permanent for that individual; it is inheritable and alters the genetic makeup of future generations. The long-term effects of such action are still very much unknown.

In an interesting juxtaposition, another argument against gene editing is that it removes the genetic lottery of reproduction. If it is possible to alter a person's genes to remove and change attributes such as predisposition to disorders, it is also possible to change just about any other attribute. For example, if individuals have a family history of degenerative vision and they want to guarantee that their child will not inherit the disorder, scientists could edit that gene to ensure their children are born with perfect vision.

However, they could also edit the

→ **Brave New World highlights the spectre of eugenics which still colours attitudes to genetic work**

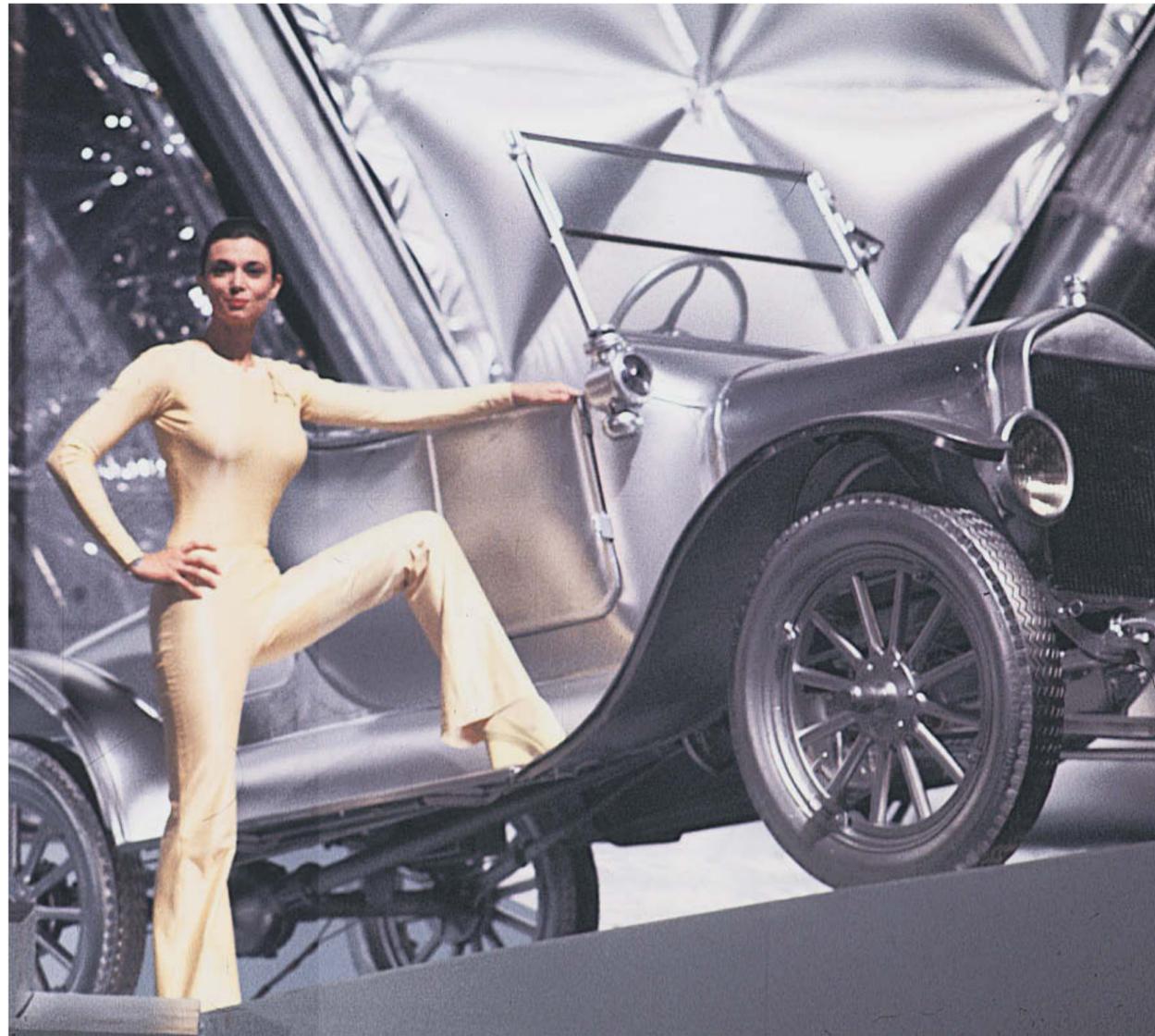
genes that determine the colour of a child's eyes together with just about any other physical feature.

Ever since the writer Aldous Huxley published his science fiction book *Brave New World* in 1932, the world at large has feared the spectre of eugenics which promotes a superior genetic heritage. It used to seem a long way off (the book is set in the year 2540) but technologies like CRISPR have brought the future a whole lot closer. CRISPR may be too immature to use for altering human genes right now but with some of science's best minds working day and night to iron out the problems it is very likely that progress will be forthcoming.

So before one gets to that point, serious and inclusive public ethical discussion is necessary to determine if society should use technologies like CRISPR, just because it can.

● **Dr Calum MacKellar is director of research at the Scottish Council on Human Bioethics, 15 North Bank Street, Edinburgh EH1 2LS**

● **He will be discussing these issues in greater detail as part of a panel discussion on the ethics of gene editing at the CRISPR Summit (www.crisprsummit.com) in London on 9 December.**



Stopping smoking is a win-win situation for every one of tobacco's victims

Health and finances, especially among the lower paid, are both hit by addiction

The message that stopping smoking is a great way to save money is getting more attention in public health circles, and for good reason. There are at least two ways to consider the cost of a cigarette. In health terms the answer is straightforward – 11 minutes. That's the average amount of life estimated to be lost from smoking one cigarette. So for every 100 packs of 20 cigarettes a shop sells, 15 days of life expectancy goes up in smoke from the community that shop serves.

In financial terms the calculation is more complicated. Bought cigarettes typically cost around 42p each. Much of that price represents tax, but a fair chunk of it is tobacco industry profit. The 2013 profits of the top six tobacco com-

panies worldwide were equivalent to the combined profits of The Coca-Cola Company, Walt Disney, General Mills, FedEx, AT&T, Google, McDonald's and Starbucks in the same year.

Roll your own tobacco and illicit tobacco both typically come in at roughly half the price of manufactured cigarettes. Illicit tobacco may also help fund serious crime such as trafficking in people, weapons and drugs.

However all forms of lit, smoked tobacco are immensely damaging to health.

Crunching the numbers for the various sources of smoked tobacco gives an overall estimate of around £2,300 a year for a 20-a-day smoker. The economic costs of maintaining a smoking habit or addiction are huge, and they hit people particularly hard in those communities where income is lowest and smok-

ing rates are high. ASH Scotland calculates that reducing the smoking rate in Scotland's most deprived areas by just 1 per cent (from 34 per cent to 33 per cent) would release around £12.5 million extra finance into the household budgets of people in those communities every year. There are few interventions which can deliver that level of benefit.

Some will argue that reducing the tax on tobacco would be one way to reduce the monetary burdens of tobacco on our poorest communities. But price has a strong impact on smoking rates, and motivates smokers to quit. Reducing the cost of tobacco would lead to more smoking, and more harm to people's health.

You hear less often that around half of the recent increases in the price of tobacco have stemmed not from Treasury tax policies but from the tobacco

industry's own price hikes, introduced under cover of national tax increases and boosting tobacco company profits. Tobacco companies are making obscene amounts of money out of people in Scotland.

The industry is fond of presenting itself as a legal industry and as purveyors of pleasurable consumer experiences. But smoking is an addiction of childhood. Most adult smokers say they started as children, and the majority wish they hadn't. Every day in Scotland around 36 children under 15 start their journey as smokers, and for many the initial experimentation goes on to become a lifetime drain on their finances and health. At the same time, for another 36 people a day that journey comes to a premature end due to an illness caused by tobacco. Smoking has blighted the lives of so many. For

each one of the 13,000 adults in Scotland whose lives are cut short each year by tobacco, there are some 20 people living with chronic and disabling conditions caused by smoking – cancers, heart disease, lung diseases, stroke, dementia. Almost half of the adults who are long-term sick or disabled in Scotland are current smokers, and on average their needs for care and support come nine years earlier than for ex-smokers and never-smokers.

A few years ago a Lancet editorial characterised tobacco as "surely the most cruel and corrupt business model human beings could have invented".

Any consideration of the health and wellbeing of Scotland's communities demands that we continue the regulatory pressure on tobacco, the most harmful consumer product on general sale. At the same time there are opportuni-

ties. Reducing smoking rates could be a highly effective part of Scotland's drive to reduce the harms from poverty, and the sooner we put reducing smoking at the heart of our anti-poverty agenda the better.

● **Lancet editorial, [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(11\)60181-5/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)60181-5/fulltext)**



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