Nuclear Power?
No Point!

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Executive summary

ES1 This report argues that:

a. Nuclear power generates less than 4% of UK energy. This is a lot less than could be **saved** by energy-conservation measures in homes and businesses.

b. Increased use of nuclear power could **not** play a significant role in reducing CO2 emissions. This is because we urgently need to meet challenging short-term targets, and new nuclear power stations could not come into service fast enough. By contrast, mature renewable technologies could deliver major CO2 reductions within the necessary timelines.

c. Investing resources in nuclear energy, including skills as well as cash, could help starve renewable energy of the resources it needs in the immediate future if we're to make short-term as well as longer-term CO2 reductions.

d. Nuclear power - including the associated costs applying the necessary safety measures and dealing with the radioactive wastes - is simply too expensive to be seriously considered.

e. It has been argued recently that dynamic demand management and the construction of a European supergrid alone would successfully deal with any problems relating to gaps in the supply of wind-generated energy. Therefore nuclear energy would not even be needed to fill any anticipated energy gaps. And this is before we take account of such energy sources and potential sources as biomass and concentrated solar power.

f. In the context of a recession, the government has a duty to facilitate job-creation. The Labour government's supposedly “green” stimulus package includes nuclear power stations, which would create very few new jobs inside the next decade. Building the proposed new stations would create temporary jobs in the construction industry, but then so would renewable energy infrastructure. And it has long been accepted that nuclear power stations ultimately sustain only a fraction of the number of jobs per unit of electricity, by comparison will renewable energy. So the need to create jobs cannot be considered a justification for building nuclear power stations.

ES2 Drawing on recent studies, this report shows that the case for the so-called “nuclear renaissance” gets progressively weaker, while the argument that Britain and the world could do without nuclear power continues to get stronger as green technology improves and the potential for demand-reduction, in ways that would impact only positively on quality of life, is increasingly recognised.

1. Nuclear energy is not necessary

1.1 Nuclear power provides less than 4% of UK energy. [1] [2] Demand-reduction measures including insulation, solar thermal (pre-heating of water), solar photovoltaic (generating electricity in every home and business) could save far more energy than nuclear power stations generate. [3] And while generating nuclear energy costs money, demand-reduction measures pay for themselves over time. Demand-reduction measures are risk-free.

1.2 Arguments that nuclear is necessary are unfounded, and recent studies have continued to show this. A June 2009 study from Harvard University argued that even if only working at 20% of installed capacity, onshore windfarms could supply all the world's electricity. [4] At the end of June 2009 Scottish and Southern Electric claimed that all of Scotland's electricity could be generated from from hydro power alone within a decade. [5] The very next day research from analysts Poyry said that the UK would be able to massively expand wind power by 2030 without suffering power cuts. [6] The weight of argument that Britain could rely on renewables seems to be building fast.

1.3 Friends of the Earth has argued that “clean coal” power stations, using carbon capture and storage (CCS) technology expected to be available by 2020, would allow the UK to do without any new nuclear power stations. [7] There is, however, some controversy over CCS, not least because it would lock the UK into dependency on fossil fuels. But It has been argued recently that Europe could build an electricity supply based entirely on renewable energy by 2030. Scientists made a presentation at the House of Commons in June 2009 arguing that an electricity "supergrid" across Europe and North Africa could solve the problem of the intermittency of wind

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[1] Friends of the Earth UK say 3.1%: Neil Crumpton (FoE), correspondence with Rachel Western. Greenpeace says less than 4%: "Nuclear power contributes almost nothing to our enormous heating requirements. In fact it contributes less than four per cent to our overall energy needs. And building new nuclear power stations (as the government wants to do) won't increase that share." http://www.greenpeace.org.uk/blog/climate/the-convenient-solution-20070718.

[2] Friends of the Earth has argued that nuclear power is fundamentally unnecessary: see Neil Crumpton, “Nukes Not Necessary,” 25 June 2009.

[3] Exact potential savings of energy from conservation measures are beyond the scope of this report. However, in June 2009 an exhibition at the Building Centre in Store Street, London, featured, for example, "A 'super insulated' block of homes with annual heating bills of under £100" and "a low carbon refurbishment in southeast London showing how carbon dioxide emissions can be cut by 80 per cent" in which "triple glazing, a condensing boiler, solar thermal collectors, LED lighting and photovoltaics together achieve fuel savings of £800."

[4] "The analysis suggests that a network of land-based 2.5 megawatt turbines operating at as little as 20 per cent of rated capacity, confined to non-forested, ice-free regions would be more than sufficient to account for total current and anticipated future global demand for electricity. The potential for the contiguous US could amount to more than 16 times current consumption. Important additional sources of electricity could be obtained by deploying wind farms in near-shore shallow water environments." See http://www.telegraph.co.uk/earth/energy/windpower/5603178/Wind-farms-could-supply-planets-power.html.

[5] "Scotland could be generating enough hydro power to meet the equivalent needs of every household in the country in less than 10 years... Scottish and Southern Energy (SSE) unveiled plans for two new large-scale pumped storage hydro electric schemes in the Great Glen, which could increase Scotland's hydro capacity by more than 70%. They would be the first pumped storage schemes to be developed in Britain since work began on the Dinorwig scheme in Wales in 1974, which became the largest in the UK." *Herald* 30 June 2009: http://www.theherald.co.uk/news/news/display.var.2517244.0.Hydros_potential_to_power_all_Scots_homes_in_a_decade.php.

[6] BBC 1 July 2009: http://news.bbc.co.uk/1/hi/sci/tech/8127177.stm.

[7] See eg Neil Crumpton, “Nukes Not Necessary,”25 February 2009.

turbines and solar power and dispense with the need for nuclear and CCS power stations altogether. [8]

1.4 Concentrated solar power from deserts also offers potential. A German consortium due to be set up this month (July 2009) including Siemens, Deutsche Bank, and the energy companies RWE and E.on, backed by Munich Re, hopes to be able to fuel Europe from solar energy within a decade, from the Desertec project expected to cost £340bn. [9]

1.5 So if we can improve energy conservation and continue to develop renewable energy sources, there is no point generating nuclear electricity.

2. Nuclear energy could not bring about emissions-reduction fast enough to make a serious contribution to tackling climate change

2.1 In June 2008 the International Energy Agency produced scenarios that showed that, even if existing world nuclear power capacity could be quadrupled by 2050, the nuclear share of world energy would still be below 10%. This would reduce carbon dioxide emissions by less than 4%. [10] The generally accepted world target is for 80% reductions from 1990 levels by 2050. The Green Party believes that to be fair to developing countries the UK target should be higher – 90% cuts by 2030. [11]

2.2 In the UK, the government target for emissions reduction by 2020 is currently 34%, and there is pressure to make the target more challenging.[12] The Green Party believes the target should be in excess of 50%, or preferably more, by 2020 if we are to have a realistic chance of achieving cuts of 90% by 2030. But whatever the 2020 targets are, new nuclear power stations could have no bearing on them at all, as they would not be built before then.

2.3 So there is no point building nuclear power stations "to help tackle climate change."

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8 See "Green 'supergrid' could plug Europe into renewable power by 2030, say scientists," David Strahan, *Independent on Sunday* 14 June 2009.

9 See "German blue chip firms throw weight behind north African solar project," *The Guardian* 17 June 2009, http://www.guardian.co.uk/environment/2009/jun/16/solar-power-europe-africa.

10 *Energy Technology Perspectives 2008*, IEA/OECD, June 2008. Quoted in "Nuclear power: a dangerous waste of time," Greenpeace, April 2009, page 10. See: http://www.greenpeace.org/raw/content/international/press/reports/nuclear-power-a-dangerous-was.pdf.

11 Green Party policy in the *Manifesto for a Sustainable Society* is: "CC201 Climate research from the Potsdam Institute suggests that average global emissions will need to be reduced by at least 60% of the 1990 baseline by 2030. This equates on average to a 90% reduction in emissions by developed countries by 2030. Following the principle of convergence this requires UK emissions to be cut by 80-90%." See http://policy.greenparty.org.uk/mfss/mfsscc.html.

12 The 34% target proposed by the Committee on Climate Change (CCC) was accepted by the chancellor in the April 2009 budget. The CCC has proposed a higher target of 42% to be adopted within two years, once a new global agreement has been reached. Prof Kevin Anderson of the Tyndall Centre for Climate Change Research pressed the Environmental Audit Committee to support a 40%-by-2020 target now, ahead of the Copenhagen summit scheduled for December 2009. Prof Anderson has criticised CCC's carbon budget because it does not adequately factor-in emissions from food, deforestation, aviation and shipping or from the manufacture of goods overseas for the UK. See: http://www.guardian.co.uk/environment/2009/jun/23/anderson-climate-change-uk-emissions.

3. Claiming that nuclear power offers a solution to climate change creates a false sense of security

3.1 Professor Andrew Blowers of the Open University, and former member of the UK government's Committee on Radioactive Waste Management (CoRWM) commented in 2007:

> *"[Nuclear power] would provide the illusion of a solution to the problems of global warming and energy security which required no fundamental changes in production or consumption. It is this business-as-usual aspect of nuclear that is its most insidious characteristic. The danger is that by focusing on nuclear we refrain from recognizing the scale of the challenge we face and shirk our responsibility for dealing with it.*" [13]

3.2 Greenpeace UK has said:

> *"If nuclear power really was to be a panacea in the fight against climate change, and to have any real impact in reducing global carbon emissions, it would be necessary to build over 40 nuclear power plants every year for the next 75 years. ... [nuclear] is nothing more than a dangerous distraction and one that could suffocate the development of the real solutions to tackling climate change."* [14]

3.3 So the "nuclear solution to climate change" is not only imaginary – it's distracting us from the steps we do need to take if we are to avoid dangerous climate change.

4. Nuclear power is not a sustainable solution for world energy-production, because it depends upon a finite fuel

4.1 There is a limit to supplies of uranium, the metal used to fuel nuclear reactors. [15] Brendan McNamara, formerly with the Atomic Energy Authority, wrote in March 2008 [16] that it is "*already too late"* to be able to rely on uranium in the long term. [17]

4.2 So there's no point expecting nuclear to provide our energy indefinitely – unlike solar, wind and wave power, which are truly sustainable.

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[13] Source: Professor Andrew Blowers of the Open University, and former member of the government's Committee on Radioactive Waste Management (CoRWM). See *Nuclear or Not? Does Nuclear Power Have a Place in a Sustainable Energy Future*? David Elliott (editor), Palgrave, 2007, Preface (page xviii).

[14] See http://www.greenpeace.org.uk/blog/climate/brown-and-sarkozy-to-kick-off-new-nuclear-game-20080325.

[15] "Uranium Supply Crunch imminent says top uranium producer," Reuters, 11 March 2009. See: http://www.reuters.com/article/GlobalMiningandSteel09/idUSTRE52A6DL20090311.

[16] Brendan McNamara *A Briefing on Futures with Fission and Fusion,* March 2008, Leabrook Computing, Bournemouth (brenergy@leabrook.co.uk) (page 4).

[17] Factsheet 4 in the series *Secure Energy: Options for a Safer World*, from the Oxford Research Group, argues that high-quality uranium will run out in 60 years at current consumption rates. See http://www.stormsmith.nl/publications/Energy%20Security%20and%20Uranium%20Reserves-July%202006.pdf. The current IEA forecast, as featured in the IEA publication *Energy Technology Perspectives (ETP) 2008*, is for nuclear power to rise fourfold from now to 2050. We do not how the efficiency of use of Uranium 235 will change over the next 40 years. But it can be said with assurance that (a) there is sufficient uncertainty over available reserves of Uranium 235 to cause concern, and (b) a global dash for nuclear power would mean increasing competition for dwindling supplies. This would of course leave the UK strategically dependent upon imported fuel.

5. How economically reliable is the nuclear power industry?

5.1 In a recent interview in *The Guardian*, Al Gore argued that the nuclear industry is generally unable to give any reliable cost estimate for how much it would take to build a nuclear plant. [18]

5.2 In June 2009 a report from the Vermont Law School Institute for Energy and the Environment said that since the so-called "nuclear renaissance" began there has been "a fourfold increase in projected costs" of nuclear power. [19]

5.3 In the UK, the two most recent large nuclear projects (THORP [20] and SMP [21]) have been abject economic failures. [22] An indication of the mind-set that leads to the routine economic failure of nuclear projects can be seen in the revelation in April 2009 that when estimating the cost of nuclear waste disposal the UK nuclear industry doesn't even include the requirement that the disposal facility would actually be useable. [23]

5.4 In December 2008, it was reported that the much-vaunted French nuclear programme has prompted safety concerns due to increasing cost pressures. [24]

5.5 The French nuclear company EDF, which recently bought a number of nuclear power stations in the UK, is currently struggling with a very large debt and has considered selling off its assets. [25] [26]

5.6 Severe financial problems have also been reported for the French nuclear power company Areva. In June 2009 Reuters reported that Areva was experiencing "an €11 billion ($15.4 billion) funding gap". [27] It's Areva that's building the world's first EPR (European Pressurised Reactor) at Olkiluoto in Finland, a project that has run into serious difficulties. [28] This issue came to a head in May 2009 when Finnish TV broadcast details of a leaked letter from Finnish nuclear regulator

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[18] "Gore on Lovelock, nuclear power and climate change sceptics," Tuesday 16 March 2009, *The Guardian.* See http://www.guardian.co.uk/environment/blog/2009/mar/16/climate-change-al-gore.

[19] The report estimated the cost of nuclear power at around 12-20 cents per kWh, or 7-12 per kWh. "The author, Dr Mark Cooper, says there are numerous options available to meet the need for electricity in a carbon-constrained environment, but nuclear reactors are the worst from the point of view of the consumer and society. He says that ... since the so-called 'nuclear renaissance' began there has been a fourfold increase in projected costs." Letter from energy and climate consultant Pete Roche, *Scotsman* 23 June 2009: http://thescotsman.scotsman.com/opinion/Pennies-for-power.5390182.jp.

[20] The oxide reprocessing plant at Sellafield.

[21] The Sellafield mixed oxide (plutonium and uranium) fuel fabrication plant, also at Sellafield.

[22] See *Voodoo Economics*, Report by Paul Brown for Friends of the Earth (May 2008), http://www.foe.co.uk/shop/index.php?main_page=product_book_info&cPath=1_2&products_id=342.

[23] Consultation draft, *CoRWM Report to Government: Deep Geological Disposal of Higher Activity Wastes*, April 2009 page 38, para 12.11: http://www.corwm.org.uk/Pages/Current%20Publications/2550%20-%20Deep%20Geological%20Disposal%20of%20Higher%20Activity%20Wastes%20(24th%20April).pdf.

[24] *Nuclear Power in France - Beyond the Myth,* (December 2008) by Mycle Schneider, commissioned by the Greens-EFA Group in the European Parliament, page 11. See http://www.nirs.org/international/westerne/258614beyondmythfr.pdf.

[25] "Debt-laden EDF looking to sell off UK network arm," 5 May 2009, Martin Flanagan, *Scotsman*. See: http://thescotsman.scotsman.com/business/Debtladen-EDF-looking-to-sell.5233296.jp.

[26] The asset it is considering selling is its electricity distribution arm.

[27] Reuters 30 June 2009: http://uk.reuters.com/article/idUKLT14262220090630?rpc=401.

[28] "France's nuke power poster child has a money melt-down," 19 March 2009, Harvey Wasserman, The Free Press . See http://www.freepress.org/columns/display/7/2009/1732.

STUK to Areva. The letter warned of safety problems so severe that the regulators considered calling a halt to reactor construction.

5.7 Previously, in March 2009, Finland's Minister of Economic Affairs, Mauri Pekkarinen, had given an interview to *Huvudstadsbladet,* the main Swedish-speaking newspaper in Finland, [29] in which he stated that Finland was considering halting its future nuclear new build programme. [30] At the time of writing (July 2009), construction of the Olkiluoto reactor was running three years behind schedule due to a multitude of factors including quality control issues. Solving such problems inevitably means delays and extra costs.

5.8 The proposed EPR at Flamanville on the northern coast of France is also experiencing severe financial problems. The stated costs have risen by more than 20%, from £2.8bn to £3.4bn. [31]

5.9 July 2009 saw reports of serious concerns from the UK regulators over the safety of EDF's proposed reactors for Britain – and once again, having to deal with additional safety concerns and delays will put the price up. [32] Delays have also been reported recently for reactor projects in the USA [33] and Canada. [34]

5.10 In June 2009 a report from the Public Services International Research Unit at the University of Greenwich cast doubt on the ability of the nuclear industry to deliver its promised new reactors. [35]

5.11 In the UK, the Sellafield site is currently unable to fund upgrades that are critical to safety. This was pointed out by the government's safety advisory committee NuSAC [36] in summer 2008. After the committee revealed its concerns, the government quietly disbanded the committee. [37]

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[29] Online sources: in Finnish: http://www.hs.fi/politiikka/artikkeli/Pekkarinen+uskoo+korkeintaan+yhteen+uuteen+ydinvoimalaan/1135244340305. In Swedish: http://svenska.yle.fi/nyheter/artikel.php?id=153515.

[30] EasyBourse.com Monday 16 March 2009. See http://www.easybourse.com/bourse-actualite/marches/finland-needs-at-most-one-more-nuclear-reactor-by-2020—634293.

[31] "University of Greenwich professor of energy studies Stephen Thomas said 'The original stated costs were €3.3bn [£2.8bn], but these costs were re-stated in December to €4bn [£3.4bn], so they could say that they are running to budget, but it is not the original budget.'" See *New Civil Engineer* 18 June 2009, http://www.nce.co.uk/news/energy/edf-plays-down-concerns-over-flamanville-nuclear-plant/5203617.article.

[32] "French plans to lead a nuclear power renaissance in Britain have been dealt a major blow after regulators warned of serious reservations about the safety of the reactor technology earmarked for use." *The Times* 1 July 2009: http://business.timesonline.co.uk/tol/business/industry_sectors/natural_resources/article6613960.ece.

[33] *Climate Progress* blog 5 May 2009 http://climateprogress.org/2009/05/05/nuclear-power-plant-costs-progress-energy/.

[34] Reported 29 June 2009 by Bloomberg (http://www.bloomberg.com/apps/news?pid=20601082&sid=aC5HRTo7j03E) and in *Interactive Investor* (http://www.iii.co.uk/news/?type=afxnews&articleid=7396153&subject=economic&action=article) and *World Nuclear News* (http://www.world-nuclear-news.org/NN_Darlington_plans_called_off_2906093.html).

[35] See *Business prospects and risks in nuclear energy*, from 16 June 2009, http://www.greenpeace.org.uk/media/reports/business-prospects-and-risks-nuclear-energy.

[36] The Nuclear Safety Advisory Committee.

[37] "UK nuclear advisory group scrapped after warning of safety risks, insiders claim," Rob Edwards and Terry Macalister, *The Guardian* 16 February 2009: http://www.guardian.co.uk/environment/2009/feb/16/nuclear-safety.

5.12 It has been reported that Sellafield is currently uninsured [38] – and also that the market would be unwilling to insure nuclear power stations. [39]

5.13 In March 2009 a financial expert reported that utilities in the UK could struggle to deliver the government's planned £40 billion new nuclear programme due to high costs, the level of risk and the lack of debt funding in the market. [40]

5.14 So on economic grounds there's no point even considering nuclear power.

6. Jobs and the sustainable economy of the twenty-first century

6.1 There is one remaining argument that we need nuclear power stations – because they create jobs. This argument is entirely spurious.

6.2 Although a nuclear new-build programme would of course create jobs, the cost per job would be very high. This is not because of high take-home pay for the industry's workers, but because of factors like the high costs of the necessary safety, security and regulatory measures.

6.3 It has long been known that renewable energy sustains far more jobs per unit of power than fossil fuel or nuclear energy. A recent comparison is shown below. [41]

Energy Source	**Jobs per year per TwH**
Wind	918-2400
Coal	370
Gas and oil	250-265
Nuclear	75

6.4 So there is no point claiming we need nuclear power to create jobs. In fact nuclear power has nothing to offer during the recession, and too few jobs even in the longer term.

6.5 On the contrary, to create the sustainable economy of the twenty-first century, with meaningful jobs in useful industries that don't compromise our future, Britain needs to invest heavily in renewables and energy conservation, as a matter of urgency.

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[38] Paul Flynn, EDM 1007, 10 March 2009, MANAGING PUBLIC MONEY AND PARLIAMENTARY ACCOUNTABILITY: http://edmi.parliament.uk/EDMi/EDMByMember.aspx?MID=3266.

[39] "2017 deadline at risk as draft regulations to deal with liability problems are put on ice," Olivia Boyd, *Building*, 6 Mar 2009. See http://www.building.co.uk/story.asp?storycode=3135466.

[40] "Utilities could struggle to fund £40bn new nuclear programme," Carol Millett, *Contract Journal*, 13 March 2009. See: http://www.contractjournal.com/Articles/2009/03/13/65836/utilities-could-struggle-to-fund-40bn-new-nuclear-programme.htm.

[41] It has been estimated that an energy efficiency increase of just 1% a year, sustained over a 10-year period, would create 200,000 additional jobs in the EU sustained over 10 years. From J Goldemberg, 2004, *The Case for Renewable Energies,* International Conference for Renewable Energies, Bonn, and *DG Internal Policies of the Union*, Economic and Scientific Policy Dept, Briefing Note on the employment potential of renewable forms of energy and increased efficiency of energy use, p13, referencing European Commission, 2005, *Doing More With Less – Green Paper on energy efficiency*. Cit *"It's the economy, stupid,"* Green Party 2009 election manifesto, http://www.greenparty.org.uk/assets/files/EU_Manifesto_2009.pdf.