

Q&As on Nuclear Economics

(1) The World Nuclear Association mentions various studies, which have shown nuclear power to be cheaper than fossil fuels – the University of Chicago; MIT; the French Energy Secretariat and the Canadian Energy Research Institute. That’s quite a conclusive body of evidence isn’t it?

<http://www.world-nuclear.org/info/inf02.html>

Arguably one of the most important analyses supporting the use of nuclear power in the future is a 2003 study from the Massachusetts Institute of Technology (MIT) entitled *The Future of Nuclear Power*. [1] MIT acknowledges that for new construction “*nuclear power is much more costly than the coal and gas alternatives ...*”

The University of Chicago study [2] focused on the cost of power plants that could be put into service by 2015. Its conclusions were generally consistent with those of the MIT report; namely that electricity from new nuclear plants will be more expensive than electricity from coal and natural gas. The authors noted:-

“No observers have expected the first new nuclear plants to be competitive with mature fossil power generation without some sort of temporary assistance during the new technology’s shake down period of the first several plants”. [3]

This conclusion fails to recognise that nuclear power is also a mature technology that has been commercialised for more than 50 years and has been the recipient of far more extensive government subsidies around the world than most, if not all, other sources of electricity.

The US Energy Policy Act of 2005 includes provision for \$13.7 billion in subsidies for the construction of 20 new reactors. [4] This is enough to fund the entire capital cost of six reactors. [5]

We shouldn’t be comparing the cost of nuclear power with centralised fossil-fuelled plant in any case. Renewables and Combined Heat and Power plant are already winning in the market place. Amory Lovins of the Rocky Mountain Institute says a portfolio of least-cost investments in efficient use and in decentralised generation will beat nuclear power in cost, speed *and* size by a large and rising margin. This isn’t hypothetical; it’s what today’s market is proving decisively. (See Decentralised Energy – Power for the 21st Century http://www.no2nuclearpower.org.uk/reports/Decentralised_Energy.pdf).

(2) You say that nuclear power will require subsidies, but the industry says that nuclear power is cost competitive with other forms of electricity generation. Which is right?

As mentioned above, the University of Chicago study said no-one expects the first new reactors to be built without *some sort of temporary assistance* for the first several plants. The US Government is planning to subsidise the industry to the tune of \$13.7 billion. It’s only in the UK that industry and government appear to be claiming reactors could be built without subsidy. But most people believe government guarantees will be required before any private investors will put money into the industry. [6]

(3) Isn’t Europe’s only nuclear construction project, at Olkiluoto 3, in Finland being funded by private investors without state subsidy?

The financing of Europe’s only nuclear construction project at Olkiluoto 3 in Finland is riddled with covert state subsidies. The consortium that ordered it, Teollisuuden Voima Oy (TVO), has given it a 30-year guaranteed contract. TVO includes a state-controlled power generation company and Helsinki council. The Finnish state will make good any shortfall in decommissioning costs and will take on responsibility for nuclear waste after 60 years.

The plant's French state-controlled suppliers received massive export guarantees from the French government and the project benefited from German and Swedish state support. A bank 50% owned by the state of Bavaria financed the deal at a cheap rate of interest (2.6%). The European Renewable Energies Federation (EREF) has lodged a formal complaint with the European Commission asking it to investigate whether the Finnish reactor violates state aid regulations.

A consortium of French reactor builder Areva and Siemens are carrying out the construction of Olkiluoto 3. Areva has now admitted that the project has fallen eighteen months behind schedule, and is running wildly over budget and causing financial losses for company. [7]

(4) If external costs, such as the damage done to health and the environment, were taken into account, nuclear power would be much cheaper than fossil fuels wouldn't it?

The UK Performance and Innovation Unit estimated the cost of nuclear power to be around 4.6 – 6 eurocents/kWh; CCGT around 3 – 3.5 eurocents/kWh and onshore wind 2.3 – 3.8 eurocents/kWh. The European Commission's Extern E project estimated that the external cost of gas-fired electricity was around 0.5-3.5 eurocents/kWh, but nuclear also has external costs of 0.24 to 0.74 eurocents/kWh. The external costs of onshore wind are estimated at around 0.05 – 0.26 eurocents/kWh. [8] There has been some criticism of the Extern E project for not including enough to cover the costs of waste management and decommissioning. However, using these figures would probably make nuclear cheaper than coal-fired electricity, it would not necessarily make it cheaper than gas, (although the numbers would need to be updated to allow for recent gas price rises), but it would certainly not make it cheaper than wind.

The problem with most of the standard studies (see question 1) is that they compare new nuclear reactors with centralised fossil-fuel-fired power plants and often conclude that nuclear may have cost advantages if construction costs come down and if carbon emissions are heavily taxed. But these efforts to make nuclear power appear competitive are futile, because centralised thermal power plants are not the real competitors. None of them can compete with wind and some other renewables, let alone combined heat and power and energy efficiency. [9]

(5) Didn't the Royal Academy of Engineering in the UK show wind power to be more than twice as expensive as nuclear power?

The Royal Academy of Engineering (RAE) published in March 2004, written by PB Power, which estimates the cost of electricity from new nuclear plant at 2.3p/kWh, compared with up to 5.4p/kWh for onshore wind. [10] How can there be such a divergent view about the costs of nuclear electricity? Dr Catherine Mitchell of Warwick Business School and member of the UK Government's Policy and Innovation Unit (PIU) Energy Review Team (for the first review in 2001) provides an explanation:

"The PIU examined the cost of nuclear power, both current and future, in great depth. It concluded that the figures put forward by the nuclear industry are extremely optimistic and PIU's own figures were much higher. Now, bodies such as RAE are giving the cost of nuclear power as those put forward by the nuclear industry without including other evidence based analyses, such as the PIU. It is extremely depressing that after 2 years of evidence based analysis by the Government, energy institutions continue to provide out of date and probably wrong information". [11]

RAE's figures are basically the same as numbers submitted by the industry to the Policy and Innovation Unit's (PIU) Energy Review in 2001. These figures overlap with the cost of generating electricity from Combined-cycle Gas Turbines (CCGTs) and are, therefore potentially competitive without any support mechanism. But, according to Professor Gordon MacKerron, who was also on the PIU Review Team, nobody within the investment community is anywhere near regarding nuclear power as a close competitor with CCGTs. The industry's cost predictions are pure speculation, and depend on achieving construction costs below the bottom end of the International Energy Agency's estimates and quicker construction-to-commissioning times than have been achieved in the past. [12] There is a history of serious appraisal optimism in the nuclear industry, and the two reactor-types which the UK industry was estimating the costs of have yet to be built anywhere in the world.

A portfolio of least-cost investments in efficiency and decentralized generation will be cheaper, than nuclear power and faster to implement. According to Lovins, this isn't hypothetical; it's what today's marketplace is proving decisively. Nuclear power has already died of an incurable attack of market forces, with no credible prospect of revival. Current efforts to deny this reality will only waste money, further distort markets, and reduce and retard carbon dioxide displacement. Cheaper, faster, abundant decentralized alternatives are now being bought an order of magnitude faster, and offer far greater ultimate potential. (See Opportunity Costs of Nuclear Power http://www.no2nuclearpower.org.uk/reports/Opportunity_Costs_Nuclear.pdf). Lovins says without subsidy, wind power in the US costs around 4.6c/kWh which is still cheaper than subsidized power from new coal and nuclear plants. [13]

(6) The cost of managing and disposing of nuclear power plant wastes represents about 5% of the total cost of the electricity generated. This doesn't affect the cost of nuclear power all that much does it?
<http://www.world-nuclear.org/info/inf04.html>

One of the big problems for potential investors in new reactors is the uncertainty. There really is no knowing what waste and decommissioning costs will prove be. There are just too many variables, and vast periods of time over which the variables will change. Nowhere in the world is there a final solution to the problem of what to do with high level waste, for example, so the ultimate liabilities will be far from certain. Burying UK waste deep underground could cost as much as £10bn, according to the UK's Committee on Radioactive Waste Management, and no-one knows what the full decommissioning costs will be. Some nuclear companies say they will need some sort of scheme, which required only limited contributions to decommissioning costs for new plants.

UK taxpayers are now facing a bill of around £160bn for cleaning up after the nuclear industry including British Energy's seven nuclear power stations, Ministry of Defence sites and the long-term storage of waste. [14] Clearly, not all of these costs would apply to a new civil reactor programme, however, these huge amounts of money give some idea of the scale of the problem. Companies would be expected to establish a segregated decommissioning fund, so that sufficient funds are available for waste management and decommissioning by the time the reactor closes. But the only way to ensure that the required funds are available is to make such a fund a legal requirement.

The privatised nuclear company, British Energy (BE) did have a decommissioning fund, but, according to the UK National Audit Office, the Government failed to effectively monitor it. [15] BE was forced to approach the Government in September 2002 for financial support, after becoming virtually bankrupt. Under a restructuring plan the UK Government accepted financial responsibility for up to £5bn of BE's nuclear liabilities (waste management and decommissioning costs).

Friends of the Earth Europe estimates that the total combined liabilities held by European nuclear operators are at today's prices in excess of €500bn. Although some *operators* in some territories are required to put a share of their income into a special fund to meet liabilities when they become due, this is not the case for all operators. Moreover, whilst some existing *funds* may have or be expected to gain sufficient resources to meet forecast liabilities, many do not. In either case, there is or will be a deficit, which as the UK cases have shown is likely to be substantial. Unless there is effective preventative regulatory action, such deficits will most likely be met by taxpayers. [16]

In France EdF has squandered its reserve funds on investments worldwide. EdF is confronted with huge liabilities, and stocks of weapons-useable plutonium, but insufficient funds to cover them. The company is seeking to transfer its massive liabilities to the government waste agency, Andra, and billions in state aid, because, it says, these liabilities are not compatible with a liberalised electricity market. [17]

(7) Patrick Moore, a former Greenpeace leader, echoes what Tony Blair and others say - because global electricity demand is rising (the US will need 45 per cent more electricity by 2030), we will need renewables, energy efficiency *and* nuclear power. In tackling climate change, surely we cannot afford to ignore any low carbon energy source?
<http://www.world-nuclear.org/reference/ih150506.html>

This idea suggests that we have infinite amounts of money to spend on energy projects, which is obviously nonsense. Resources are scarce, so we need to make choices. Because climate change is a serious and urgent problem then we must spend our limited resources as effectively and quickly as possible - best buys first, not the more the merrier. For each dollar we spend we need to buy the maximum amount of “solution” possible. (The “least cost” solution) On both criteria, cost *and* speed, nuclear power is probably the least effective climate-stabilizing option on offer.

Globally nuclear power supplies about 15.8% of current electricity generation, which is only 2.5% of global final energy consumption. [18] It is, therefore, not wise to be focus almost exclusively on electricity – we need to look at the problem of carbon emissions more holistically.

The Massachusetts Institute of Technology report entitled “*The Future of Nuclear Power*” envisions 1000GW of installed nuclear capacity by 2050. One might imagine this tripling of installed capacity would have a significant impact on carbon emissions, however, this is not the case. In fact carbon emissions from the electricity sector would continue to rise, because of increasing demand, despite the huge amounts of money spent on new reactors. As the Greenpeace Energy Scenario for Europe shows, the only way to provide for our energy needs and reduce carbon emissions is by a combination of energy efficiency and renewable energy. [19]

[1] <http://web.mit.edu/nuclearpower/>

[2] University of Chicago (2004) “The economic future of nuclear power”.

[3] Quoted by Smith, B (2006) “Insurmountable Risks” IEER.

<http://www.no2nuclearpower.org.uk/reviews/index.php>

[4] Where will Blair hide his nuclear tax bombshell? Liberal Democrat Trade and Industry Team, June 2006.

<http://www.libdems.org.uk/media/documents/policies/Nuclear-tax-bombshell.pdf>

[5] Centre for Media and Democracy 26th July 2006

<http://www.prwatch.org/node/5008>

Washington Post 25th July 2006 [http://www.washingtonpost.com/wp-](http://www.washingtonpost.com/wp-dyn/content/article/2006/07/24/AR2006072400976.html)

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[6] Independent 12th July 2006

http://news.independent.co.uk/business/analysis_and_features/article1173249.ece

[7] Guardian 18th April 2006

<http://www.guardian.co.uk/letters/story/0,,1755555,00.html>

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http://www.eref-europe.org/downloads/pdf/2004/EPR_Finland.pdf

Also see speech by Satu Hassi MEP and Former Minister of Environment in Finland in UK House of Commons 9th

November 2005. <http://www.satuhassi.net/puheet/praseg.pdf>

And the Olkiluoto Info website: <http://www.olkiluoto.info/en/>

[8] See Greenpeace International (2004) Sea Wind Europe, p36.

<http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/6204.pdf>

[9] Nuclear power: economics and climate protection potential by Amory Lovins, Rocky Mountain Institute, Updated 6th January 2006.

http://www.rmi.org/images/other/Energy/E05-14_NukePwrEcon.pdf

See also Mighty Mice, by Amory Lovins, Nuclear Engineering International 21st December 2005

<http://www.neimagazine.com/story.asp?sectionCode=188&storyCode=2033302>

[10] PB Power for the Royal Academy of Engineering (March 2004) ‘The Cost of Generating Electricity’,

http://www.raeng.org.uk/news/publications/list/reports/Cost_of_Generating_Electricity.pdf

[11] Dr Catherine Mitchell of Warwick Business School and member of the Government’s Policy and Innovation Unit (PIU) Energy Review Team, speaking at the Friends of the Earth “Meeting Scotland’s Energy Needs” Conference in Edinburgh on 21st May 2004.

[12] MacKerron, Gordon (September 2004) ‘Nuclear Power and the Characteristics of Ordinarity – the Case of UK Energy Policy’ NERA Economic Consulting.

[13] More profit with less carbon, by Amory Lovins, Scientific American, September 2005

<http://www.sciam.com/media/pdf/Lovinsforweb.pdf>

[14] Independent on Sunday, 2nd April 2006

<http://news.independent.co.uk/business/news/article355080.ece>

[15] NAO, 6/2/04 http://www.nao.gov.uk/publications/nao_reports/03-04/0304264.pdf

[16] EU Nuclear Liabilities, FoE Europe Briefing Paper, July 2005,

http://www.foeeurope.org/publications/2005/EU_Nuclear_Liabilities.pdf

[17] EDF Declines Comment on Critical Nuclear Report, Reuters 28th January 2005

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[18] Key World Energy Statistics, IEA 2005

<http://www.iea.org/dbtw-wpd/Textbase/nppdf/free/2005/key2005.pdf>

[19] Energy Revolution: A sustainable pathway to a clean energy future for Europe, GPI Sept. 2005

<http://www.greenpeace.org/raw/content/international/press/reports/energy-revolution-a-sustainab.pdf>