Hugh Richards BArch MA MRTPI June 18th 2010

Response to the consultation document on a Fixed Unit Price methodology and updated cost estimates

Chapter 3: The methodology to determine a Fixed Unit Price

1. Do you agree or disagree that prospective operators of new nuclear power stations should be given the option to defer the setting of their Fixed Unit Price? If so, do you agree that this deferral should be limited to 10 years after the nuclear power station has commenced operation?

The case for the government and taxpayer taking on any risk for any of the waste and spent fuel management and disposal costs from new build has not been made. The whole idea of a Fixed Unit Price is deeply flawed, and flaunts IAEA guidance on mechanisms for financing the safe management of spent fuel, so the methodology to determine it is irrelevant. The incoming government should have withdrawn this consultation, and this response is simply to put on record some of the reasons.

Spent fuel from a new nuclear power programme raises different ethical, technical and sustainable development issues from those associated with legacy wastes. These have not been addressed in any of the previous government's consultations on new nuclear power stations.

Setting a "fixed unit price" for waste 'disposal' when approval is given for a new reactor effectively caps the cost to the operator of nuclear waste disposal and transfers the risk of cost overruns to the taxpayer.

It is vital that the industry is made to bear all the costs of nuclear power generation. In 2008 government stated that energy companies:

> "would be prepared to pay a significant risk premium over and above the expected costs of disposing of waste and spent fuel, in return for having the certainty of a fixed upper price". [1]

It is now clear that energy companies are not prepared to pay that significant risk premium and the "expected Fixed Unit Price" (eFUP) to be offered to prospective investors is a device to secure investment by reducing the amount of money nuclear operators have to set aside now while transferring yet further risks to the taxpayer.

There are no grounds for believing that costs that will be incurred in the period 2130 – 2190 can be ascertained any more accurately in the year 2030 than now. Direct disposal of spent fuel in deep underground repositories will remain an unproven concept. Fundamental questions about the type of material to be used to encapsulate spent fuel, its rate of corrosion, and the need to accommodate gas within the cylinders, are unlikely to be resolved.

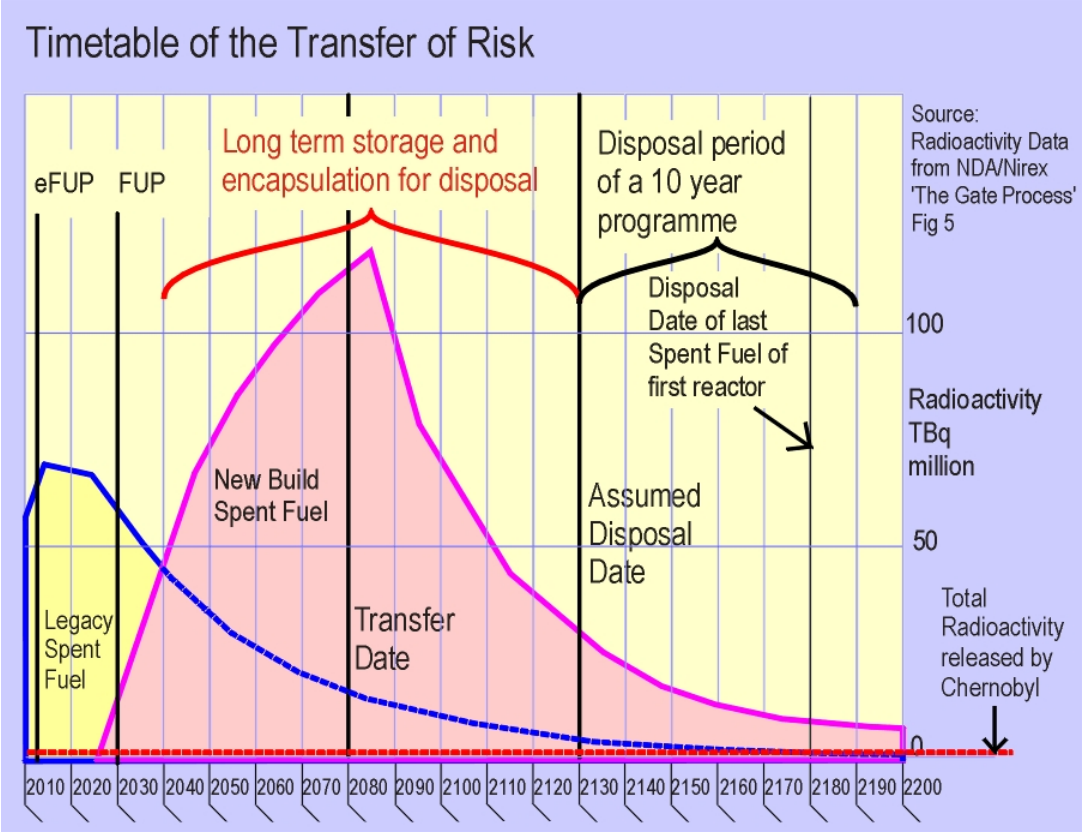
Very high burnup spent fuel is more demanding at every stage from the reactor itself, subsequent cooling in ponds, through drying and storage in dry casks or continuous pond storage, to eventual burial. Its storage and disposal arrangements are subject to great technical and scientific uncertainty, yet very little information has been provided for the public to make a judgement as to whether to accept responsibility. In proposing that the taxpayer takes title to and responsibility for high burnup spent fuel, the agencies and departments of government have not exercised 'due diligence', leaving them open to legal challenge at any time. It is inevitable that any price set now will be revisited, and that international conventions will require a mechanism for securing adequate funding that is regularly reviewed.

The current regulatory regime is 50 years old. The continued existence of institutional control over the next 200 years cannot be guaranteed. Sea level rises over the century from 2080 have not been modelled so the risks to future generations from long term storage are likely to increase.

Any level of disposal charge fixed now would expose the future taxpayer to the risk of huge uncovered liabilities

2. Do you agree or disagree with the proposal that the Schedule for the Government to take title to and liability for an operator's waste should be set in relation to the predicted end of the decommissioning of the nuclear power station?

The consultation claims that because of the very long timescales involved it considers the Government is better placed than an operator to manage cost risks. [2] These risks are massive as this chart illustrates.



A study of radioactive waste implications associated with a 10 GW programme of new build reactors undertaken by NIREX in February 2007 [3] illustrated the build up of radioactivity that would be stored on the sites of new reactors. By the 2080 transfer date the amount of radioactivity from a new 10GW programme will be twice the 2015 peak of all radioactivity from Britain's nuclear legacy. By 2075 when it is intended that HLW and spent fuel from the legacy waste may be placed in a deep underground repository the new build waste will contain six times as much radioactivity as legacy waste.

It would be irresponsible to accept cost estimates made now about something which will not happen until 2130. This attempt to fix the future will become an embarrassment before long and is bound to be revisited by the next five generations and 24 'fixed term' Parliaments.

From the perspective of corporate entities planning investments and returns, a twenty year horizon is perfectly sufficient for shareholders. If risks and additional unanticipated costs associated with long term spent fuel storage and disposal can be offset by capping them, by providing "certainty to operators" this effectively transfers burdens to future generations. It is an unambiguous subsidy to induce investment.

Corporate interest in the adequacy of funds set aside for long term management encapsulation and disposal will be set by the assumption of 2.2% continuous growth in the size of the fund. Up to 95% of the funding required for disposal from 2130 is assumed to come from interest, so only a very small fraction of the income from electricity generation will be put into these funds. Funding cannot be allowed to be dependent on accruing interest to make up the majority of the funds.

It is very unlikely that the corporate entity paying into the funds will be in existence when the expenditure is required, and almost certain that the funds will be inadequate for the task.

Doubts were expressed at the 2002 Trawsfynydd public inquiry about the burden of requiring future generations to try to sustain the continuous economic growth necessary to realise the financial gains from small resources set aside during reactor operation. [4]

> "The required funds calculated for decommissioning……have been based on the use of a real growth rate for funds (2.5% post-tax) that, although modest, may not be achieved. The use of these assumptions….places a burden on future generations to ensure that funds invested today grow at a sufficient rate. It is questionable whether the use of cost discounting…. can be considered to satisfy the principles of intergenerational equity and sustainable development."

The government's advisors on sustainable development have addressed this issue:[5]

> "…the costs arising from nuclear power stations will long outlast the benefits of consuming the electricity produced by them.

"…resources being set aside today…..will need to grow over decades or centuries.
"This may….saddle future generations with large and certain costs but uncertain means of meeting them."

Cost discounting is an unacceptable burden on future generations, and represents a subsidy to the nuclear industry.

3. **Do you agree or disagree that the proposed methodology to determine a Fixed Unit Price strikes the right balance in protecting the taxpayer, by taking a prudent and conservative approach to cost estimation, while facilitating new nuclear build by providing certainty to operators?**

No, for the reasons given above. The consultation does not contain sufficient relevant detailed information to judge whether OND DECC's calculations are correct, but they are clearly partial and incomplete. Too many uncertainties remain. It is clear that 'burdens of cost, effort and worker radiation dose' will be transferred to the future generations that have to retrieve the fuel from its long term storage, safely encapsulate it in containers for disposal and emplace it deep underground. These exposed individuals will not have received any benefit from the new reactors to offset any radiation detriment they suffer.

As high burnup spent fuel would be far more hazardous but doesn't yet exist, its creation requires a quite separate and more rigorous process to test and validate proposals for its management and disposal.

The long term storage of high burnup spent fuel is expected to result in greater fuel cladding failure, with consequent higher risk of radiation exposure for the generation attempting to retrieve and condition the failed fuel elements.[6]

Rather than practical and detailed strategies for the long term storage and conditioning of radioactive waste over the next two hundred years, reactor vendors and prospective operators have put forward information which is vague and unsatisfactory. Instead of government setting 'waste acceptance criteria' (WAC) at the outset so that the public knows in advance what will be accepted for disposal, WAC are to be set much later, when the disposal facility is more advanced. The cost implications are profound and have been ignored. The operator will be responsible for 'reworking' failed fuel elements after long term storage, but no practical information about its disposal has been offered, and it is highly unlikely that the operator will still be in existence a century after the income stream has ceased.

The likelihood is that all spent fuel, including that which fails the acceptance criteria because of corrosion or defects, will become the responsibility of future generations of taxpayers.

Prospective operators of new nuclear power stations have been open about wanting the taxpayer to take title to and responsibility for their high burnup spent fuel 'as soon as practicable'.

> "The option should be available to the operator to transfer the ownership of and responsibility for spent fuel before the end of the decommissioning phase, for example, to transfer spent fuel to NDA some years after the end of irradiation, or as soon as practicable. [7]

The FUP proposals are designed to allow nuclear operators to evade their responsibilities of creating high burnup spent fuel, storing it for 100 years and conditioning it for disposal. There are no historic examples of corporate entities conditioning their toxic wastes a century after the income stream has ceased.

4. Do you agree or disagree with the proposed approach to determining an operator's contribution to the fixed costs of constructing a Geological Disposal Facility?

Disagree strongly. As high burnup spent fuel will be twice as hot and twice as radioactive as the legacy spent fuel that the government wants to dispose of, it will require twice as long to cool down before disposal. Sites of new nuclear power stations will accumulate and store this hazardous material above ground over very long periods.

A central conclusion of the NDA's disposability assessments for spent fuel from the reactors proposed for England and Wales is that, after 100 years cooling, the spent fuel may be disposed of in the same repository as 'legacy' spent fuel because its additional footprint will be small relative to that of the legacy waste repository. [8]

> "A fleet of nine such reactors (AP1000) would require an additional area of approximately 1 km2, excluding associated service facilities. This represents approximately 6% of the area required for legacy HLW and spent fuel per AP1000 reactor, and approximately 55% for the illustrative fleet of nine AP1000 reactors. This is in line with previous estimates for potential new build reactor designs."

This is based on a series of bold and mistaken assumptions. (tunnels spaced at 25 metres, few reject holes etc). On realistic and reasonable assumptions (tunnels spaced at 40 metres, 23% reject deposition holes) the spent fuel repository footprint necessary for a 10 GW new build programme would, with associated service facilities, exceed the 3 sq km required for legacy HLW and spent fuel. Doubling the footprint of the deep geological repository, and operating it for over a century after the legacy repository 'is not tenable' for geological and practical reasons. As the 2008 White Paper on managing radioactive waste safely puts it: [9]

> "Closure at the earliest opportunity once facility waste operations cease provides greater safety, greater security from terrorist attack, and minimises the burdens of cost, effort and worker radiation dose

transferred to future generations…however……. it is likely to be at least a century until final closure is possible, which the UK Government believes provides sufficient flexibility for further research to be undertaken to achieve public confidence and approval..."

Keeping one facility open, and disposing of both new and legacy radioactive waste in the same repository facilities represents the worst of all possible options. Delaying final closure until 2190 represents a massive additional burden which has not been quantified.

An entirely separate repository for new-build waste would help the Government to try to convince the public that there is no hidden waste disposal subsidy to support the energy companies. It would also help the nuclear industry to show its resolution to fulfill its responsibilities for radioactive waste management, and as new power stations are decommissioned later than existing plants the new-build facility could stay open longer, without threatening the integrity of the legacy waste facility.

5. Do you agree or disagree with the proposal that the units to be used for the Fixed Unit Price are pence per kWh for spent fuel and cubic metres of packaged volume for intermediate level waste?

Any “fixed unit price” for waste ‘disposal’ represents a cap on liabilities which will transfer risks to the taxpayer.

Chapter 5: Updated estimates of the costs for decommissioning, waste management and waste disposal

6. Do the updated cost estimates represent a credible range of estimates of the likely costs for decommissioning, waste management and waste disposal for a new nuclear power station?

No, they lack any credibility. In 1979 the UKAEA estimated that a repository capable of taking 3,500 vitrified cylinders of heat emitting high level waste would cost £100 million (roughly £450 million in 2010 pounds) [10]. This bears no relation to estimates made in 2007.

The fact that the ‘likely costs for decommissioning, waste management and waste disposal’ have doubled in the last three years, because basic attributes of high burnup spent fuel have belatedly been recognised, suggests an intolerable degree of ignorance or indifference.

As high burnup spent fuel will be twice as hot and twice as radioactive as the legacy spent fuel that the government wants to dispose of, it will require twice as long to cool down before disposal. Sites of new nuclear power stations will accumulate and store this hazardous material above ground over very long periods. According to the International Atomic Energy Agency (IAEA) any

benefits of lower electricity costs during the operation of reactors in this way will be offset by an increase in the cost of managing the spent fuel. [11] The problem is that the costs will long outlast any benefits, in effect transferring burdens to future generations.

Utilities that are not prepared to accept the risks and the uncertainties associated with all waste management and disposal costs should opt for other forms of low carbon generation or efficiency measures with lower risks.

This response should be read in conjunction with earlier responses to the 'non consultation' on fixed unit prices.

Hugh Richards BArch MA MRTPI June 18th 2010

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1 Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Station, BERR, February 2008, para 2.9 http://www.berr.gov.uk/files/file44486.pdf

2 http://www.decc.gov.uk/en/content/cms/consultations/nuc_waste_cost/nuc_waste_cost.aspx Para 1.10

3 NIREX The Gate Process: Preliminary analysis of radioactive waste implications associated with new build reactors February 2007 Number: 528386 page 19

4 Trawsfynydd Public Inquiry Inspector's Report APP/H9504/X/02/5141 Appendix 3 - Assessor's Report 10 February 2003, 5.3 Determination of Decommissioning Strategy. Para 49 iv

5 FORGING AN ENERGY POLICY FOR SUSTAINABLE DEVELOPMENT A Paper for the Energy Policy Review of the UK Government from THE SUSTAINABLE DEVELOPMENT COMMISSION October 2001 page 29

6 IAEA-TECDOC-1089 Storage of spent fuel from power reactors. Proceedings of a symposium held in Vienna, 9-13 November 1998. 'EXTENDING DRY STORAGE OF SPENT LWR FUEL FOR UP TO 100 YEARS' R.E. EINZIGER, Argonne National Laboratory, Argonne, IL. M.A. MCKINNON, Battelle,Pacific Northwest Laboratories, Richland, Washington A.J. MACHIELS, EPRI, Palo Alto, CA. para 3.7 page 346

7 EDF submission to the Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations. May 2008, Para 4.1.9, 6th bullet (spent fuel)

8 Geological Disposal Generic Design Assessment: Summary of Disposability Assessment for Wastes and Spent Fuel arising from Operation of the Westinghouse AP1000. October 2009; Geological Disposal Generic Design Assessment: Summary of Disposability Assessment for Wastes and Spent Fuel arising from Operation of the UK EPR. October 2009

9 Managing Radioactive Waste Safely, A Framework for Implementing Geological Disposal. June 2008. A White Paper by Defra, BERR and the devolved administrations for Wales and Northern Ireland. Chapter 4: Preparation and planning for geological disposal Page 28 para 4.20

10 'Radioactive Waste – Policy and Perspectives' L.E.J Roberts UKAEA, page 19. a lecture given to the British Nuclear Energy Society in Nov 1978, published by UKAEA in April 1979.

11 IAEA-TECDOC-1299 Technical and economic limits to fuel burnup extension. Proceedings of a Technical Committee meeting held in San Carlos de Bariloche, Argentina, 15–19 November 1999 IAEA July 2002 http://www-pub.iaea.org/MTCD/publications/PDF/te_1299_web.pdf