

The Environment Agency's Magnox Consultation – Ideas for Responding to the Environment Agency

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Introduction

In 1998 British Nuclear Fuels Ltd (BNFL) took over the control of Britain's oldest nuclear power stations from another government-owned company, British Energy. The Magnox stations (so called because of the type of fuel they used) are located at six sites in England (Sizewell, Bradwell, Dungeness, Hinkley Point (recently closed), Oldbury and Berkeley (closed)), two in Wales (Trawsfynydd (closed) and Wylfa) and one in Scotland (Hunterston, now closed).

Over the past two years BNFL have been negotiating with the Environment Agency for the issuing of a new radioactive discharge license in England and Wales (the review does not include Hunterston) under the Radioactive Substances Act 1993. The license governs –

- the discharge of radioactive materials into the environment,
- the incineration of radioactive waste at some of the Magnox sites or the transfer to commercial incinerator plants, and
- the transfer of solid radioactive wastes to Drigg in Cumbria for disposal.

The Environment Agency are now consulting the public on the terms of the discharge authorisations. The public have until the 31st August to send their views to the Environment Agency.

The purpose of this briefing is to help people identify certain issues they may wish to make objection upon to the Agency.

The Environment Agency's consultation

In June the Agency issues a pack of documentation for public consultation for each site – over 800 pages of information per site, over 7,500 pages in total. This was supplemented by new information released during late July due to the recent decision to close the Hinkley Point A reactor. As well as being able to receive printed copies of the documentation (by phoning 0845 601 2428) you can also access the information via the Internet at:

<http://www.environment-agency.gov.uk/consultations/>
However, if you want to access to the information on the Internet you will need the latest version (version 4.05) of

the Adobe Acrobat reader program.

Each pack contains a copy of the Agency's consultation report, and a bundle of reports and letters from BNFL on different issues. Although there has been an effort by the Agency to write the consultation report in non-technical language, it does assume that the reader has a lot of prior knowledge about nuclear issues. It also assumes that you have access to a wide range of other documents – e.g. government policy documents – that only specialist campaigners or consultants will have, and which are unlikely to be found in local libraries.

Anyone can reply to the Agency's consultation. There is no restriction on age or even nationality. Also, people living in Wales can reply in Welsh. But however you reply, to be valid you need to supply a name and address. There are various options for sending your comments to the Agency:

- You can post them to The Environment Agency, BNFL/Magnox Consultation, PO Box 446, Bedford MK42 0ZR;
- You can email them to bnfl.magnox@environment-agency.gov.uk; or
- You can call 0845 601 2428 and leave a message on their machine.

Finally, and most importantly, the Environment Agency are responsible for regulating the discharge or disposal of radioactive materials. They are not responsible for the safety of the plants. Therefore if you reply on issues about safety your comments will be ignored. But that is not a restriction – in fact it is quite useful. The Agency are required to have regard to the acceptability of radioactive discharges in terms of public safety and public acceptability. Therefore they must have regard to the view and fears of the public on the discharge or disposal of radioactivity. They cannot, as the safety regulators do, solely rely on engineering principles to prove safe operation.

The issues

The Magnox reactor programme was the first civil nuclear power programme in the world. However, as well as generating energy, one of the other priorities was the production of plutonium for Britain's nuclear bomb

programme. Hence, when they were being designed, the efficiency or safety of the plants did not have the highest priority.

In determining the applications for discharge, the Agency are required to have regard to their 'statutory guidelines'. These were defined by the government in 1996. In general, these guidelines require the Agency [1]:

- to protect or enhance the environment, taken as a whole;
- to build on the work of the existing bodies in protecting and enhancing the environment to lay greater emphasis on the need to look at the environment as a whole, through an integrated approach, rather than at individual media in isolation;
- to place the Agency's activities more firmly in the context of sustainable development;
- to take a holistic approach to the protection and enhancement of the environment – and through its actions to optimise benefit to the environment as a whole, taking proper account of all likely costs and benefits;
- because it needs to take a long term perspective in considering sustainable development, to seek to take properly into account any longer term implications and effects, particularly those which appear likely to be irreversible, reversible only at high cost over a long timescale or which would raise issues of intergenerational equity; and
- conserving and where practicable enhancing biodiversity and protecting the natural heritage is an essential element of sustainable development.

It is arguable that the Agency have not properly considered their overriding legal responsibilities when considering these applications (more on this below).

The consultation on the Magnox stations discharge licenses raises three main issues:

- The economic and engineering case for permitting the discharges;
- The environmental impact of the discharges, particularly on wildlife; and
- The effect of the discharges on human health, and the ability of the Agency to permit the discharges when recent scientific evidence indicates they are unsafe.

There are also a number of other specific legal and site-related complaints, but for the purposes of this briefing only the general issues are dealt with.

1. Economics and Engineering

BNFL have made the case for, and the Environment Agency appear to have accepted, a case for continued operation based on economic principles. The argument works like this:

- If we keep operating the plants, we generate income;
- If we keep operating the plants we can discount – i.e. devalue according to inflation – the final decommissioning costs a few years into the future and therefore it costs less; therefore
- All in all it's cheaper to keep operating than have to pay for decommissioning today.

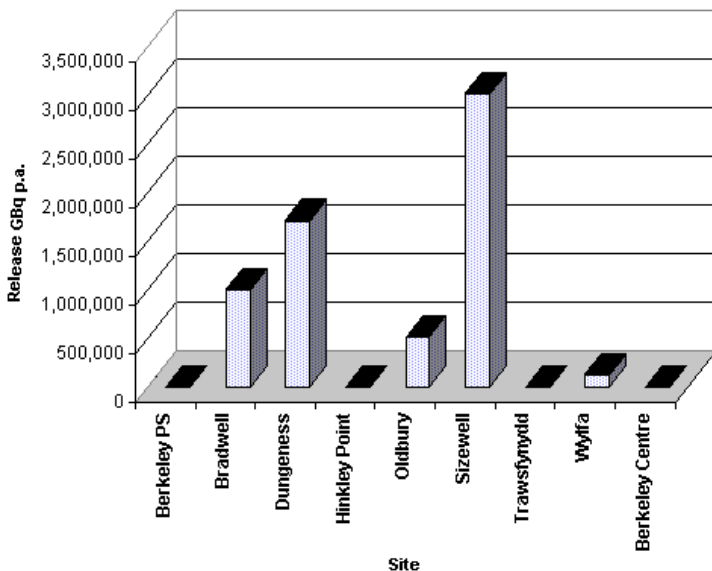
The problem with this argument is that it ignores the indirect costs – for example the devaluing of the environment when wildlife is harmed or land contaminated, or the costs of treating those who become ill due to the discharges from Magnox plants.

Power generation is one of the largest sources of man-made radioactivity discharged into the environment. It is not the source of some of the most dangerous radioactive substances – e.g. plutonium – but it does produce the largest quantity of total radioactive releases. A large proportion of those radioactive discharges are also released to the air, rather than to the sea, and so have a significant impact on the environment and populations around the power stations. The operation of the reactor also creates an intense field of radioactivity – called the '*gamma shine*' – up to 1 mile from the plant. Therefore, in terms of nuclear installations, power generation is as significant a source of pollution as other operations such as reprocessing. The Magnox stations are also some of the dirtiest nuclear generation plants in the world.

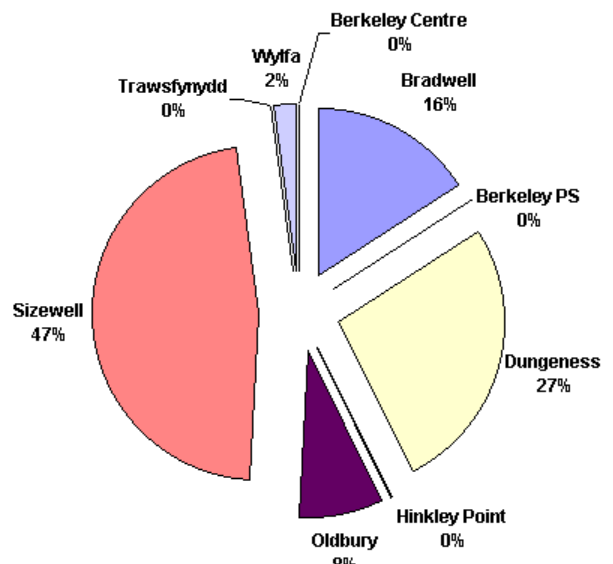
We have to question the acceptance of a purely economic argument that ignores externalities. For example, the discharge of radionuclides can be assumed to cause a certain amount of treatable illnesses. The costs of treating these illnesses should be deducted from the 'positive' economic values. The impact on wildlife, especially those habitats and species protected as being the most valuable, must also be deducted from the economic value of operation.

The failure to consider the holistic implications of operation when considering the economic arguments is a clear breach of the Agency's statutory guidelines. When considering health effects (more on this below) it is usual for the Agency to consider 'mortality' – or deaths – resulting from discharges. This is no longer a valid measure. Most cancers, for example leukaemia, are treatable with success rates higher than 50%. Therefore, mortality is no longer valid. We have to consider the 'incidence' of illness created by discharges because this represents a significant economic drain on the national economy.

The operation of the plants also raises issues regarding the valuation or justification of the discharges from each site. For example, the operation of Sizewell A represents 47% of the entire discharges from the Magnox power programme. Compare this to the Wylfa plant that represents only 3% of discharges. Also, when considering the engineering and economic



Total radioactivity releases from each Magnox site



Comparison between sites

benefits/disbenefits of operation we also have to consider the alternatives to providing the energy these stations create:

- Nuclear power is more expensive than other forms of conventional power generation, and is more expensive than some renewables such as wind, tidal and small-scale thermal/photovoltaic solar panels;
- Nuclear power, because of the problems of public acceptability and the costs of generation, is, in the views of the Department of Trade and Industry's energy advisory committee [2], unlikely to represent a viable generation option in the future;
- In terms of the radioactive emissions, these can be compared in various ways, but the Magnox stations represent the largest emissions of radioactivity per unit of energy generated.

It is also possible to look at efficiency in terms of nuclear fuel. Magnox stations generate 120 giga-Watt hours of electricity per tonne of fuel. The AGR reactors generate 600 giga-Watt hours per tonne of fuel – five times more efficient. Finally, the Sizewell B PWR generates 1,200 giga-Watt hours per tonne of fuel – ten times more efficient. The Agency cannot consider Magnox stations an environmentally efficient means of generating power.

Whilst the Magnox stations themselves represent a significant source of aquatic discharges, the reprocessing of Magnox fuel represents one of the largest contributions to the discharges from Sellafield. B205 represents about 10%-15% of critical group doses due to Sellafield airborne discharges, and 80-90% of critical group doses due to liquid discharges [3]. This is because the B205 reprocessing plant at Sellafield, like the Magnox power stations, was designed to maximise reprocessing capacity to produce plutonium rather than minimising environmental discharges. For an equal quantity of nuclear fuel, the plant is far dirtier than the new THORP plant.

The UK is committed to reducing emissions of radioactivity to 'background levels' under the Oslo/Paris Commission's (OSPAR) 'Sintra' agreement. This agreement limits the discharge of radioactivity into the aquatic environment. There are arguments about whether reprocessing should take place or not. OSPAR's latest statement is seeking to end reprocessing by the British and the French. But if we reduce the argument just to the environmental impacts, if Britain is to meet the OSPAR commitments by the 2020 deadline then the B205 plant must close. That can only happen if the Magnox stations close a number of years before that deadline.

BNFL is proposing to change the design of fuel for Magnox stations. Instead of uranium metal clad in magnesium – MagNox, they'll use uranium oxide coated in stainless steel – MagRox. They will decide on its use in 2003. This has serious safety implications for the operation of the two plants it is proposed to use this fuel in – Wyffa and Oldbury. But aside from the safety issue, there is another imperative for BNFL introducing this fuel. Magrox could be reprocessed in the THORP plant. Magnox fuel cannot. Therefore, the introduction of the Magrox fuel could be a means of extending the life of the two Magnox stations BNFL have identified. This would mean B205 could close to meet OSPAR's 2020 deadline, but because Magrox fuel has not been approved use in Magnox stations by the Nuclear Installations Inspectorate this cannot be relied upon. Therefore, in terms of this authorisation process, the Agency should not rely upon its introduction as a means of enabling the early closure of B205 at Sellafield.

In conclusion then, the arguments people should put to the Environment Agency are:

- In terms of engineering, the Magnox stations are the dirtiest, and represent the largest discharges of radioactivity per unit of energy generated than other

nuclear power plants.

- Because of their excessive discharges, the Environment Agency should not authorise the continued operation of Sizewell, Bradwell and Dungeness.
- In terms of economics, the arguments from BNFL ignore the external costs of operation – in particular the value of damaged habitats and the costs of treating those who become ill because of the radioactive discharges. The Agency must, because of the statutory obligations, consider the externalities in the economic case.
- The need to close B205 at Sellafield to meet the OSPAR deadline restricts the life of the Magnox plants. Therefore, in terms of the total emissions from the Magnox programme, the Agency should seek the early close of all Magnox stations in order that the higher aquatic emissions from decommissioning, and the discharges from B205 at Sellafield, can cease well before the 2020 deadline.
- We have to question not only the validity of the basis of the economic assessment, but also whether it is possible to defer decommissioning. This is because in order to meet Britain's OSPAR commitments not only will Magnox stations have to close, but the B205 plant at Sellafield must be decommissioned too. The introduction of Magnox fuel sometime after 2003 cannot be relied upon because it has not been approved for use in Magnox power stations, and it is still unclear what effect this fuel would have on plant discharges.

2. Environmental impacts

Nearly all considerations of the environmental impact of radioactive discharges relate to the impacts on human health (this is considered in the next section). Likewise, the monitoring of wildlife for radioactivity is related to the human food chain, not to the ecological food chain in general. The only consideration of the impacts on the natural environment is in terms of the de-scaling and anti-fouling agents used in cooling water for the power stations.

In each edition of the consultation report, annex 7.2 considers the effects of the discharges on habitats. This follows the general line created by the International Committee on Radiological Protection (ICRP). That is, discharges can be assumed to have the same impact on wildlife as they do on man, and therefore if it's safe for humans it must be safe for wildlife. Not only does this position contradict a logical assessment of how the discharges impact the natural environment, but no evidence has been advanced by ICRP to support it. In fact recent studies suggest that wildlife is far more exposed to radioactive discharges than humans.

BNFL take the ICRP line [4]. They also cite a 1990 Nature Conservancy Council report that concludes there is not enough data to decide if discharges affect wildlife

or not. That is not the case today. There are new studies regarding the effects of the Chernobyl accident on wildlife. There has also been more monitoring of radioactive substances in wildlife. For example, recent monitoring has shown a build-up of tritium in wildlife around the discharge pipe from Nycomed Amersham in Cardiff that cannot be explained by current environmental fate models.

The view of the Agency, again originating from the ICRP guidelines, is –

'Occasionally, individual members of non-human species might be harmed, but not to the extent of endangering whole species or creating imbalances between species'.

This position is incompatible with the law on nature conservation. The Conservation (Natural Habitats &c.) Regulations 1994 implement the EC Habitats Directive. This protects certain 'designated site' such as 'Special Protection Areas' (SPAs) and 'Special Areas of Conservation' (SACs). The discharges from some Magnox plants affect both SACs and SPAs, and this is acknowledged by the Agency.

Where the Agency have erred is in ignoring the parts of the regulations relating to protected species. Certain species of plants and animals, identified in the Habitats Directive, have absolute protection under the law. These cannot be harmed, killed or moved without a license from the conservation regulator – e.g., the license that contractors had to get from English Nature to build the Newbury Bypass because it affected a protected snail. If these '*individual members of non-human species*' directly harmed by discharges are protected species under the Habitats Directive then those discharges are unlawful.

There is one area where the Conservation Regulations have not properly implemented Article 12 of the Habitats Directive. This relates to the 'indirect' damage to protect areas or species. This would be significant where the level of discharge does not directly cause harm, but the bioaccumulation of radioactivity in the environment over time, or concentration through the food chain, will cause damage. Such indirect damage through the concentration of discharges could be considered unlawful under the Directive.

All-in-all, it is possible to demonstrate that the Agency have not discharged their legal obligations to protect nature conservation under the Conservation Regulations. Their whole approach to the issue of the effects on the natural environment is also inconsistent with their obligations under the government's statutory guidelines.

It would be helpful if the public could object on these issues, and in particular:

- The Agency's failure to consider the impact on species protected under the Habitats Directive, given that they accept certain species of wildlife will be harmed;
- The Agency's acceptance of the ICRP's guidelines,

in contravention of their own responsibilities the Agency's statutory guidelines to protect and enhance wildlife;

- Their failure to require BNFL to prove, using properly gathered and evaluated data, to demonstrate that protected species will not be harmed directly by discharges, and that the bioaccumulation of radioactivity within the food chain or in the environment will not lead to indirect damage to protected species (essential given that certain species are given absolute protection under the law).

3. Human health impacts

There is increasing evidence from research in many countries that the basis of our current risk estimates for radiation doses is wrong – perhaps by a factor of 100 to 300 times. These changes in the estimation of risks from radiation are due to a number of factors –

- **The reassessment of health impacts on Japanese atomic bomb survivors:** The risk models for radiation exposure are based mostly on the observations of people exposed to radiation at Hiroshima and Nagasaki. There has been a significant re-evaluation of the statistics upon which all the models are based, due in part to new information about radiation-related illnesses that were left out of the statistics immediately after the bombing (the majority of data begin around 1950, so up to 5 years of effects are missing).
- **New evidence on the risks of alpha radiation:** Doses of radiation are quantified as a single figure – the Sievert. The exposure to different types of radiation are scaled according to a 'quality factor' to represent the different level of risk each presents. Alpha radiation was considered to have little effect because of its limited ability to penetrate the body. But recent studies have shown that alpha radiation has a far more harmful effects. Radiation can break stands of DNA, potentially leading to mutation. A break of one of the two DNA strands can be repaired because there is a copy of the DNA sequence in the other strand. But a 'double strand break' (DSB) cannot be repaired because there is no copy to transcribe from. This creates a far higher risk of cell mutation. These effects have more recently been reinforced by studies of radiation works, and those living in areas with naturally high radon levels. Alpha radiation, because it is more likely to cause DSB's, is therefore far more hazardous than the 'quality factor' used in everyday risk assessments assume. Dose rates are not therefore representative of cell damage.
- **New evidence in relation to genomic instability:** Related to the issues of single- and double-strand DNA breaks is genomic instability. DNA can repair itself. But incorrect repair can lead to cell mutations (a mutation is a incorrect DNA transcription during cell division). But this does not necessarily happen

with the first cell division – it may occur some time later. If the tissues affected are involved in reproduction, this instability can also affect future generations. The issue of genomic instability has been related to the observed increase in illness in the children of radiation workers. But genetic instability could also be responsible for a wider range of illnesses than those traditionally associated with radiation exposure.

- **Evidence on the differing susceptibility of the population to radiation:** This is again related to the poor statistics on Japanese bomb survivors. Because of the errors in data collection, those who were more susceptible to the effects of radiation had succumbed before the systems to collect information in the 1950s. Evidence on the proximity of people to the bomb blast, gauged by the reports of other injuries sustained, have also been shown to be inaccurate. Together with other recent studies involving radiation workers, or in vitro cell cultures, it is clear that genetics plays a large part in a persons susceptibility to radiation. This issue has not been considered within the current systems of dose assessment, and therefore certain members of the population could be put at greater risk than others.

The Government's advisors on radiation and health are the National Radiological Protection Board (NRPB). They advise the Environment Agency on radiation issues, but when making their decision of the discharge of radioactivity the Agency must decide themselves on safety – they cannot pass the responsibility to NRPB.

NRPB have been traditionally reluctant to re-evaluate radiation dose risks. Those who decide NRPB policy are, because of their professional reputations, unwilling to consider new evidence, preferring instead to rely on the old Japanese data. A large body of evidence is now emerging with regards to the contamination that resulted from the Chernobyl disaster. However, despite a large amount of scientific literature to the contrary, the position of NRPB, as recently as July this year, is that Chernobyl has not resulted in any excess of cancers than would be expected under the old risk estimates (with the exception of additional thyroid cancers).

There is a wide range of evidence, on a number of different issues relating to the biological effects of radiation, that current risk estimates. Coincidentally, whilst independent scientific advice considers risks estimates are 100 times too low, recent statements by government experts indicate that low-level radiation cannot be the cause of cancer clusters because it would take radiation levels 100 times higher to produce the observed effect. Given the uncertainty about risk estimates, it important that the Environment Agency adopt a precautionary approach when considering these applications.

Whilst NRPB can advise the Agency, it is the Agency who must take legal responsibility for that decision. The Agency's statutory guidelines require that they have

regard to scientific uncertainty, and apply the precautionary approach when required. Therefore, given the scale of releases that this application seeks to authorise, the Agency must have regard to the latest scientific evidence in this case – even if this means restricting or refusing all or parts of the applications.

The public should require that the Environment Agency:

- Direct BNFL and NRPB to consider the new scientific evidence on radiation risks within their dose estimates.
- Given the new evidence on the risks of alpha radiation, alpha emitting radiation should be severely restricted.
- To have regard to the scientific uncertainty, the Agency must not rely solely on the NRPB/ICRP risks levels. Instead the Agency must seek, on a precautionary basis, to restrict emissions of radiation – even if this means prematurely closing some or all of the Magnox stations.
- Given not only the significance of emissions from power stations, but also from fuel reprocessing, the reprocessing of Magnox fuel must be considered within this process. Given the significance of B205's emissions at Sellafield, it may be that the Magnox stations must be closed as soon as possible in order to facilitate the early closure of B205.

Conclusion – the public's perception of risk

Each of the above sections have highlighted a different aspect of the Magnox consultation, and the basis on which the public may object to what the Environment Agency propose. These are issues that deal with certain technical or scientific issues. However, there is one more issue that the Agency must have regard to – the public's perception of risk, and from this, the need to have regard to the precautionary principle.

In other areas of law public perception of risk and hazards is becoming more important – within the planning system especially. The *Browning Ferris* case [5] has set a precedent that public concern, even if objectively unfounded, is a material consideration to be taken into account by decision-makers. The *Browning Ferris*, *Broadland* [6] and *West Midlands Probation Committee* [7] cases also established that public concern per se requires no objective expert justification. In some circumstances an objectively unfounded, albeit genuine, fear can of itself constitute a valid reason for refusing permission.

We also have to bring in the issue of human rights, now that the European Convention on Human Rights has been enacted into UK law. It is arguable that, for a statistically identifiable proportion of the population, allowing these unjustifiable discharges is a breach of the 'right to life' under Article 2. If the Agency fail to investigate claims relating to the reliability of radiation

risk estimates, instead falling back on NRPB advice, that is also a breach of the 'right to process' under Article 6.

In this case, the discharges from the Magnox programme as a whole – that is the power stations and the discharges from reprocessing in B205 at Sellafield – create a concern amongst the general public. However, this concern is not unfounded. There is significant evidence that the continued operation of these plants does pose a risk to the environment, wildlife and human health. This risk, in terms of the Agency's requirement to balance costs and benefits, is also predicated on a minimal level of power generation. Finally, given the requirement to meet Britain's agreements under OSPAR, and given the short life of these power stations, we have to ask if there is an objective justification for their operation.

As a general objection, we would suggest that the public:

- Specify that the uncertainties about the impacts of radioactive discharges on the environment and human health cannot be resolved within the current parameters set by the Agency – i.e. the risk estimates supported by the industry – and that the Agency must seek significantly reduced discharges or refuse to permit the stations to operate.
- Make a clear statement that authorising these discharges, given the recent scientific evidence on radiation hazards, is a breach of human rights.
- Request that if the Agency cannot proceed to resolve the issue regarding risk levels and radiation discharges, then they must call a public inquiry to resolve the issue – if they do not then it is likely, perhaps certain, that the public would seek to judicially review the Agency's decision to permit these discharges.

We hope that you can put together an objection and send it off given the limited time available. *Remember, the deadline for objections arriving at the Agency is the 31st August.*

References

1. The Environment Agency's statutory guidelines are enabled under section 4 of *The Environment Act 1995*. The guidelines themselves are published in a 1996 government statement, *The Environment Agency and Sustainable Development*.
2. The DTI Energy Advisory Panel's report, *The Role of "Diversity" in the Security of Supply in Electricity*. Published in *The Energy Report 1999*, DTI 1999.
3. Figures taken from BNFL's submissions, published within the Environment Council's *BNFL Stakeholder Dialogue, Discharges Working Group Interim Report*, 28th February 2000.
4. BNFL's response to Question 9 of the first round of Environment Agency questions
5. *Newport Borough Council v SoS Wales and Browning Ferris Environmental Services Ltd* [1998]
6. *West Midlands Probation Committee v. Secretary of State for the Environment and Walsall Metropolitan Borough Council* [1998]
7. *R. v. Broadland District Council and others ex parte Dave, Harpley and Wright* [1998]