NUCLEAR POWER AND HEALTH IN GLOUCESTERSHIRE

A report by
Severnside
Campaign
Against
Radiation
1986

NUCLEAR POWER AND HEALTH IN GLOUCESTERSHIRE

Severnside Campaign Against Radiation is a non-party political organisation formed by concerned parents and grand parents, following the revelation of a childhood leukaemia cluster in and around Lydney over the period 1979-83.

SCAR has been concerned with investigating low level radiation and obtaining relevant information on the levels and types of emissions from Berkeley and Oldbury, and in establishing the real health effects of these emissions. To this end SCAR hosted a National Conference in Gloucester in June 1985 bringing together some of the principal experts in these fields.

The Central Electricity Generating Board, Gloucester Health Authority and Paul Marland, MP for West Gloucestershire have sought to 'allay our fears'. However, many of our justified questions have been either evaded, half answered or ignored altogether, so that for every answer there are many more questions to be asked before the truth of the matter can be ascertained.

This report was first published in October 1986 for a seminar on nuclear power organised by Gloucestershire County Council. County Councillors and representatives of District Councils received presentations from the Department of the Environment, Ministry of Agriculture Fisheries and Food, Central Electricity Generating Board and SCAR. The aim of the seminar was to inform Councillors of the environmental and health effects of nuclear power on the Severn Estuary and to discuss the effectiveness of existing monitoring systems.

At their meeting in January, the County Council decided to join with the other Severnside Local Authorities in investigating and setting up a joint independent environmental monitoring scheme.

SCAR is delighted at this positive step towards better independent monitoring of radiation in the Severnside environment.

Contents

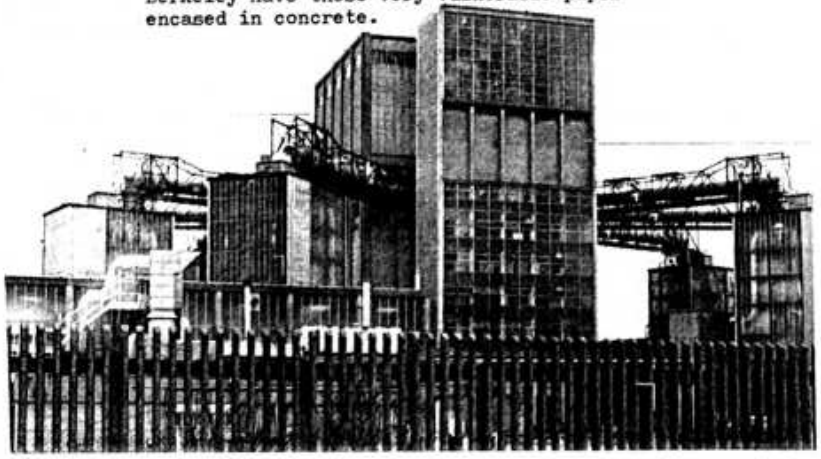
Nuclear Power on Severnside

There are 4 Nuclear Power Stations on the River Severn, Berkeley, Oldbury, Hinkley'A' and Hinkley'B'. Each of them discharges radioactive waste into the river and atmosphere every day.

Because S.C.A.R. is based in Lydney, where there is a high childhood leukaemia rate, most of our attention is focussed on Berkeley and Oldbury.

Berkeley, the oldest of all Civil Nuclear Power Stations, was designed in the 1950's using engineering standards which would not be acceptable today. A Senior Scientific Officer of the Central Electricity Generating Board said, in a meeting in South Wales in September 1986 that Berkeley's design would not be given a licence today.

Each of Berkeley's reactors has 8 exposed pipes giving it it's well known 'spider' shape. These pipes carry carbon dioxide coolant, under pressure, from the reactors to the 16 boiler units where steam is produced to turn the generators. Gamma Radiation is emitted from these pipes. All Nuclear Power stations built after Berkeley have these very vulnerable pipes encased in concrete.



SCAR believes that 4 Power Stations on one river shows a disregard for the environment. There should be no further nuclear development on Severnside. Because of its age and design, Berkeley Power Station should be closed down as soon as is safely possible.

Radiation and the Severnside Environment

Liquid Waste

The large amount of water required by the stations for their operations is discharged daily into the river Severn. This water often contains radioactive effluent from the "cooling ponds" where highly radioactive (hot) spent fuel rods from the reactors are stored to "cool down" before being transported across country for re-processing at Sellafield.

Irradiated fuel rod stocks

In May 1977 Berkeley cooling ponds held 21,000 irradiated fuel elements. In the same year Oldbury stored 15,088 fuel elements in its cooling ponds. Present stocks at Berkeley are about 2,000.(1,2)

Every day for the last 25 years, radioactive waste has been discharged into the river Severn.

The CEGB assume that this waste is carried out to sea on the tide. However, floating debris is often seen returning on the tide and the Severn Trant Water Authority have noted a "wedging" effect in the estuary which can delay the emptying process for weeks.

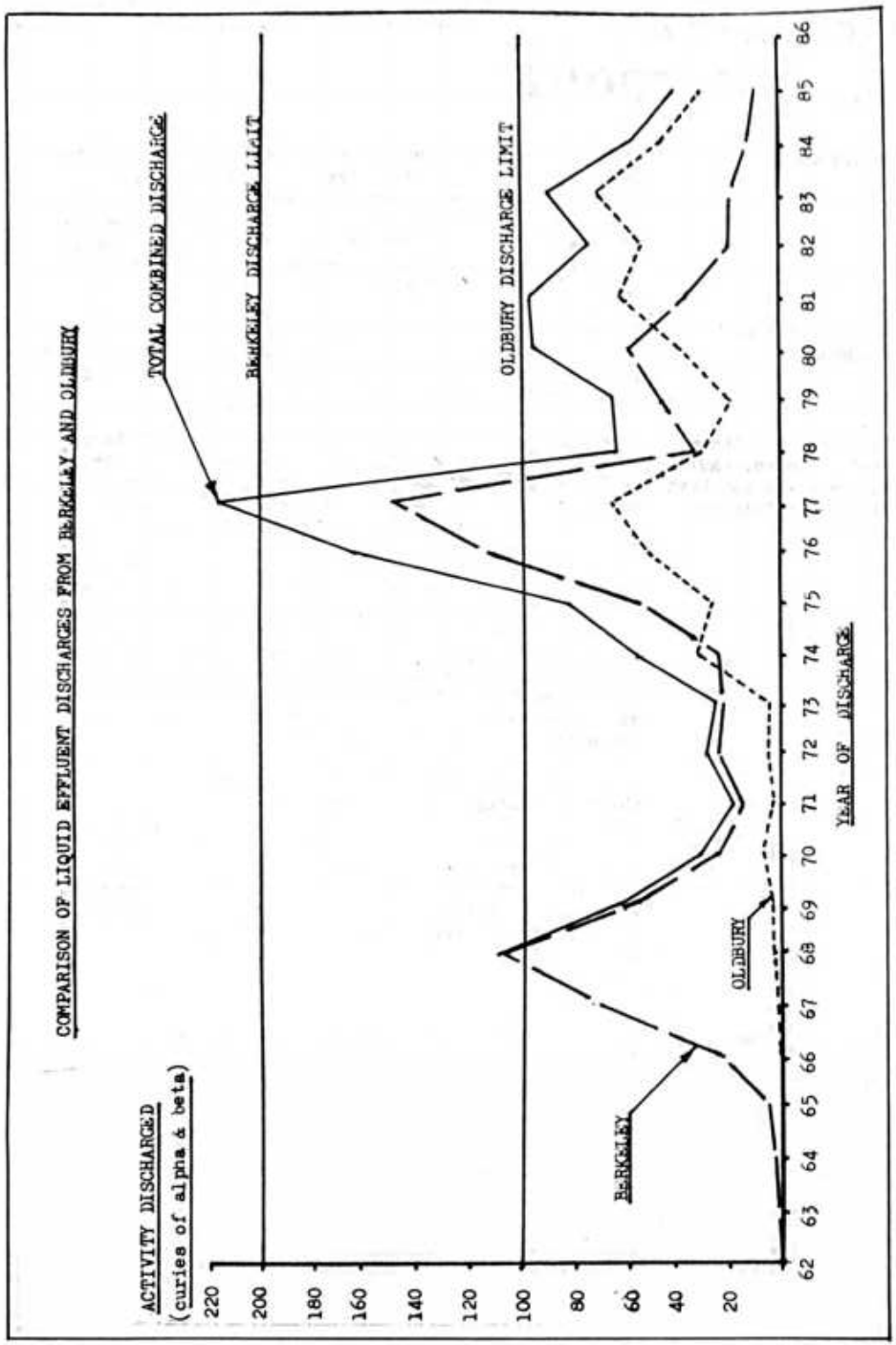
SCAR believes there could be a build up of wastes in the silt at the river bed. During low tides this easily accessible mud is exposed. During prolonged periods of dry weather this mud dries out to become dust, which can become airborne, possibly being deposited as dust in people's homes and gardens. People working or playing on the silt and mud will bring material back into their homes on clothing and footwear which may enter the body as housedust.

It appears from the 1985 monitoring results that there is a slight upward trend in radiation measurements over the intertidal silt. In addition, it appears that readings around Lydney are similar to those near the Berkeley Outfall. In contrast, readings downstream of Berkeley and Oldbury are lower. Although the differences are slight, these figures do suggest that small amounts of radioactivity are deposited on the intertidal silt on the west bank.

There are 4 Nuclear Power stations on the river Severn

Berkeley, Oldbury, Hinkley A and Hinkley B. Each of them discharges radioactive waste every day into the river and into the atmosphere.

Because SCAR is based in Lydney, where there is a high childhood leukaemia rate, most of our attention is focused on Berkeley and Oldbury.



Each of the 4 stations has a statutory Authorisation Discharge limit. Combined, they are allowed to discharge up to 600 curies of radio-activity into the Severn Estuary every year.

It can be seen from the graph that Berkeley's limit is twice that allowed for Oldbury. No power station in England and Wales has a discharge limit higher than 200 curies, and yet the combined discharge of Oldbury and Berkeley exceeded this in 1977. This high peak was due to a combination of the storage of large numbers of irradiated fuel elements at Berkeley and by drainage and cleaning of Oldbury's cooling ponds.

Oldbury's discharge limit was based on improved technology which allowed a lesser amount of radiation discharge. Because of the proximity of Berkeley, this lower level has been exceeded 3 times.(4)

SCAR recommends

SCAR recommends that the combined discharges into the estuary from all 4 stations should be taken into account and the limits reduced accordingly.

In addition to annual and quarterly discharge limits, new regulations should be brought in to limit discharges on each tide.

Monitoring of Liquid Waste

This is the responsibility of the Ministry of Agriculture Fisheries and Food and the Central Electricity Generating Board. The Ministry cites 'salmon fishermen, river authority workers, local fishermen and their families' as the critcal group 'principally exposed', while 'the two critical pathways for radiation exposure are internal radiation from consumption of locally caught fish and shell fish and external exposure from occupancy of muddy intertidal areas' (M.A.F.F. Aquatic Monitoring reports).

Private correspondence from MAFF, 28th August, 1986, has revealed that:

1) they do not take children as being a critical group although it is known that young children are the most vulnerable of all to radiation and it is known that children do go down onto the mud opposite Berkeley and Oldbury.
2) Samples upon which the dose to the critical group are based weight as little as 1 kilogram.
3) The amount of monitoring is not related to the quantity of discharge and in 1977, the year of Berkeley's peak discharge this was the total amount of monitoring undertaken by MAFF.(see table)
4) Samples are taken from the same locations every year.

Fish and seaweed	5
Mud, outlet pipe	4
Mud, upstream	2

The CEGB takes samples 4 times a year from sites exposed at low tide on the west bank - Awre, Lydney, Woolaston, Sudbury, as well as from Guscar Rock and Epney.

Considering the very limited monitoring and the absence of any independant monitoring it can not be assumed that

we have accurate information about the amounts and distribution of radioactivity in the estuary. With such limited monitoring a localised concentration of radiation could easily be unrecorded. Present monitoring arrangements by both the CEGB and MAFF are totally inadequate considering the dangerous nature of the waste involved. We believe that the prime consideration of the monitoring system should be the protection of the people and their environment.

Airborne Emissions

These are in the form of radioactive gases, mists and dusts and are emitted into the air daily.

There are also periodic peak discharges. Known radioactive particles emitted are Tritium (3), Carbon 14, Sulphur 35 and Argon 41, together with radioactive gases about which no information is available.

The Department of the Environment who authorises these discharges does not 'set a discharge limit' nor 'require regular measurements of the emissions to be made' and only requires 'the best possible means to limit their discharges'.

In 1978, of all Nuclear Power Stations in England and Wales, the top 4 contributors to the collective dose to the population were Hinkley B, Berkeley, Oldbury and Hinkley A.(5)

Monitoring of Airborne Emissions

Measurements are taken by the CEGB using takishades (a T shaped pole with white 'bags' on each end of the cross bar) and dosimeters.

Takishades have been shown to be good for particulates, less so for things like Iodene 131 and fairly useless for gases such as Argon 41.

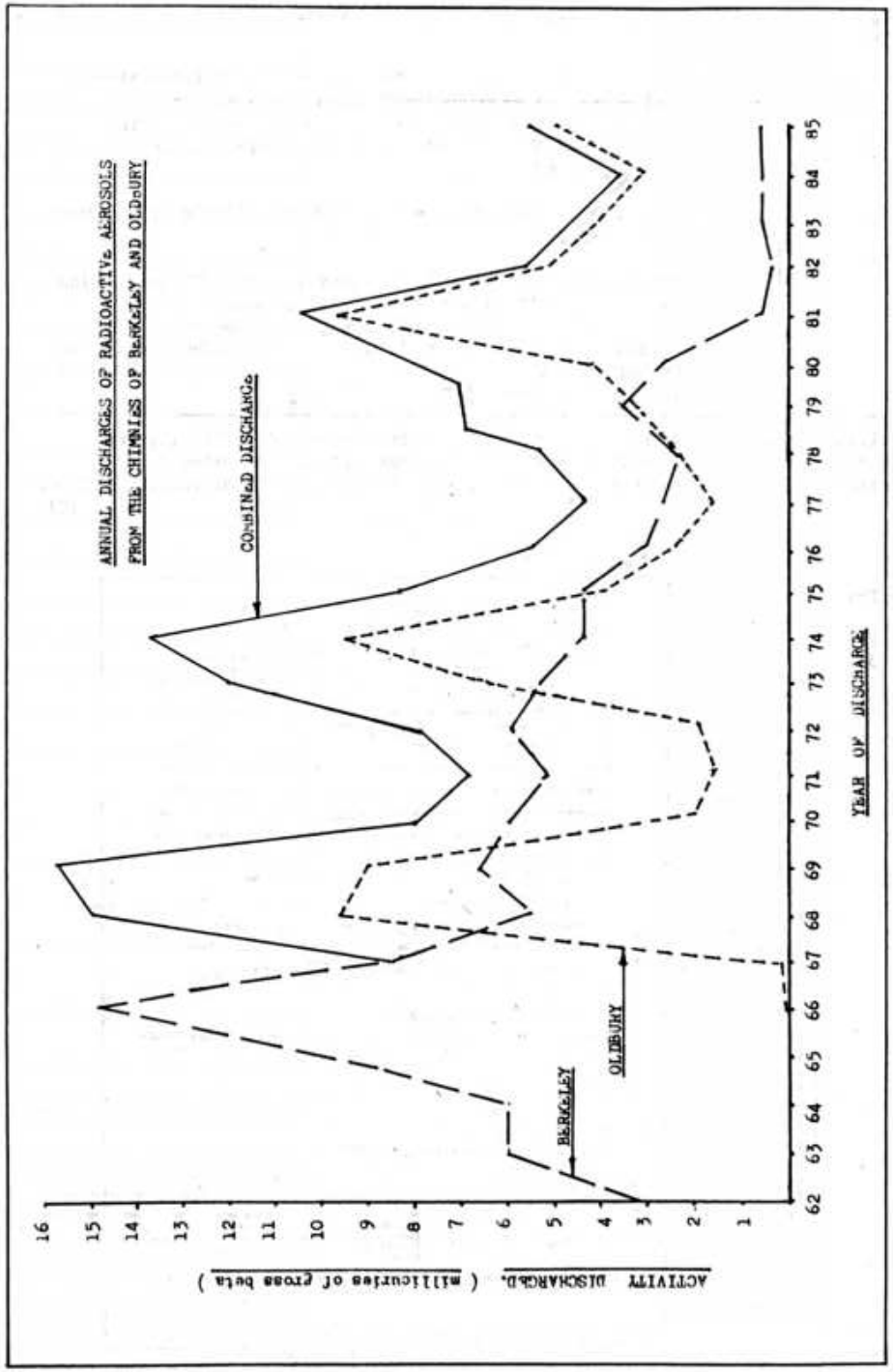
Most measurements are taken in the immediate vicinity of the power stations with a control ring at 7 miles distance. The CEGB assume that their emissions will be picked up on the inner ring, and the control ring is used for comparison.

This is an example of the amount of monitoring undertaken by the CEGB of airborne emissions at distances from the stations.

Monitoring of Airborne Emissions 1984

Distance from both stations in miles	No. of readings	No. of sites
0.5	1 per month	8
1-2	1 per month	6
2-5	1 per 3 months	7
Over 5	1 per 3 months	37

The Gwent C.C. 1985 report into Possible Radioactive Contamination in the Severn Estuary expressed concern at the lack of discharge limits on airborne emissions and the limited monitoring of these emissions. The report recommended greater control over the emissions and closer monitoring.



SCAR recommends

SCAR shares their concern and fully supports their recommendations.

The extra monitoring should be carried out independantly and should be more frequent and in more places. The present level of monitoring is too sparse to confirm safety, and short lived but highly active isotopes can go undetected.

Sir Douglas Black has recommended that limits of airborne emissions be imposed.

The Department of the Environment is currently consulting with Local Authorities with a view to improving new authorisation, early in the new year. The County Council should ensure that these limits are for a 24 hour period, rather than the quarterly and annual limits as applied to liquid discharges. (6)

Radiation levels Measured at the Perimeter fence

National Radiological Protection Board (NRPB) figures show that Berkeley gives the highest radiation dose to workers and nearby public of all power stations in Britain. (5)

1976 Environmental Monitoring Report, page 3.

Period	Mean dose-rate and standard deviation (microroentgens per hour) tidal stretch sites
October 1975-September 1976	7.9 ± 3.5

The regular measurements made on samples of fish and shellfish taken from the estuary have continued to show that their radioactive content is due entirely to naturally occurring sources and trace amounts of nuclear weapons fallout. The measurements of the gamma radiation dose rates over the inter-tidal areas are not significantly different from similar measurements made in areas remote from nuclear power stations.

The measurements continue to demonstrate that the discharge of radioactive waste from the power stations to the estuary are being controlled satisfactorily.

Levels of radioactivity in the surface and coastal waters of the UK are monitored continually and the most recent review has been published as Technical Report FRL 11 of the Fisheries Radiobiological Laboratory of the Ministry of Agriculture, Fisheries and Food.

3. RADIATION IN THE IMMEDIATE VICINITY OF THE POWER STATIONS

The levels of radiation measured at the perimeter fences here been within acceptable limits.

4. DISCHARGES TO SEA OF LIQUID RADIOACTIVE WASTE

Discharge in curies (to the nearest curie)

Period	BERKELEY Gross beta plus gross alpha (excluding tritium)	BERKELEY Tritium	OLDBURY Gross beta plus gross alpha (excluding tritium)	OLDBURY Tritium
12 months ending September 1976	303	82	33	14

3

The Peak dose measured was 90 msv.

Radiation levels at the perimeter fences of Berkeley and Oldbury are recorded throughout the year on film badges at various points around the station boundaries. The level of radiation at Berkeley varies considerably with the operation of the station because of the exposed pipework.

Recently the fence levels have been low due to limited operation. In the early years, from 1965-72, the NRPB have told SCAR that average levels would have been "about 20 msv per year, with peak values of 80-90 msv per year". These high levels are estimated to have given some workers "doses of up to 8 msv per year".(8)

(The authorised dose limit for workers is 50 msv per year.
The authorised dose limit for the public is 5 msv per year.
The NRPB recommended dose limit for the public is 1 msv per year. Natural background radiation level is 1.87 msv per year.)

Fence radiation levels have been given in Environmental Monitoring Reports since 1977, however, the letter from Dr. Bishton (over page) states that the date was first compiled in this form in 1976. The 1976 report is reproduced opposite. Although there is a gap large enough to print the data, no figures are given. The assurance that radiation levels have been "within acceptable limits" appears to have been typed on a different typewriter.

SCAR is appalled that the Department of the Environment considers such radiation levels acceptable and the lack of information available Liason Committee members.

We are concerned that radiation doses received by farm workers adjacent to the perimeter fence may be unacceptably high. These workers, their crops and farm animals should be regularly and independently monitored.

References

1) Minutes of Local Liason Committee 1977.

2) Private correspondance from Mr. Gornall, Chief Health Pysicist, Berkeley, 29/8/86.

3) Minutes of Local Liason Committee 1976/77.

4) Private correspondance from Dept. of the Environment, 30/9/81.

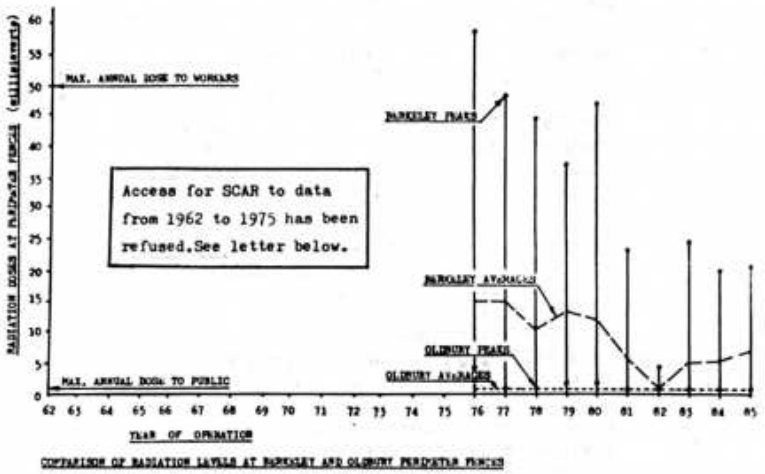
5) Environmental Resources Ltd. report to Gloucester County Council, October 1986.

6) Correspondance from the Dept. of the Environment, 39/9/86.

7) NRPB-173.

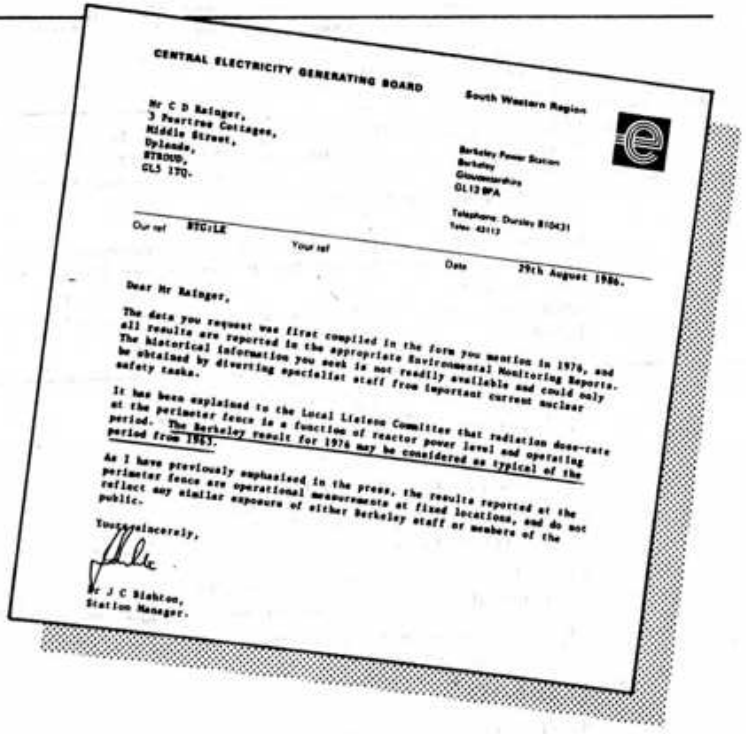
8) Private correspondance from NRPB, 17/10/86.

This page rewritten, March 87



Access for SCAR to data from 1962 to 1975 has been refused. See letter below.

COMPARISON OF RADIATION LEVELS AT BERKELEY AND OLDBURY PERIMETER FENCES



CENTRAL ELECTRICITY GENERATING BOARD

South Western Region

Mr C D Ralnger,
3 Pearlree Cottages,
Middle Street,
Uplands,
STROUD,
GL5 1TQ.

Berkeley Power Station
Berkeley
Gloucestershire
GL13 9PA

Telephone: Dursley 810431
Telex: 43113

Our ref BTG:LE Your ref Date 29th August 1980.

Dear Mr Ralnger,

The data you request was first compiled in the form you mention in 1976, and all results are reported in the appropriate Environmental Monitoring Reports. The historical information you seek is not readily available and could only be obtained by diverting specialist staff from important current nuclear safety tasks.

It has been explained to the Local Liaison Committee that radiation dose-rate at the perimeter fence is a function of reactor power level and operating period. The Berkeley result for 1976 may be considered as typical of the period from 1963.

As I have previously emphasised in the press, the results reported at the perimeter fence are operational measurements at fixed locations, and do not reflect any similar exposure of either Berkeley staff or members of the public.

Yours sincerely,

Mr J C Blshton,
Station Manager.

Radiation and Health

Radiation sources

By far the largest proportion of the radiation to which we are exposed (87%) is derived from natural background sources. Exposure to this form of radiation is unavoidable and its effects upon health are still being investigated. Indications from the latest study are that background radiation levels have a direct correlation to the rate of cancer deaths.(1)

In contrast, official estimates state that as little as 0.1% of the radiation to which we are exposed is as a consequence of the operations of the nuclear industry. Since any exposure to radiation carries with it a risk we must not be misled into believing that this is an insignificant amount.

The figure of 0.1% is an average for the whole of the UK population and does not reveal the doses that are being received by people living near nuclear installations. Such people are subjected to additional risks from the routine liquid and airborne discharges and direct radiation. Nuclear discharges do not effect the whole of the population equally as such averages may imply. Moreover data relating to the dispersal and dose from airborne and liquid discharges is based on computer computer modelling rather than actual investigations of affected populations.

In 1978 Berkeley, Hinkley and Oldbury nuclear power stations (in that order) were the three highest Magnox contributors to the UK collective dose from airborne discharges. Hinkley B was the highest AGR contributor.(2)

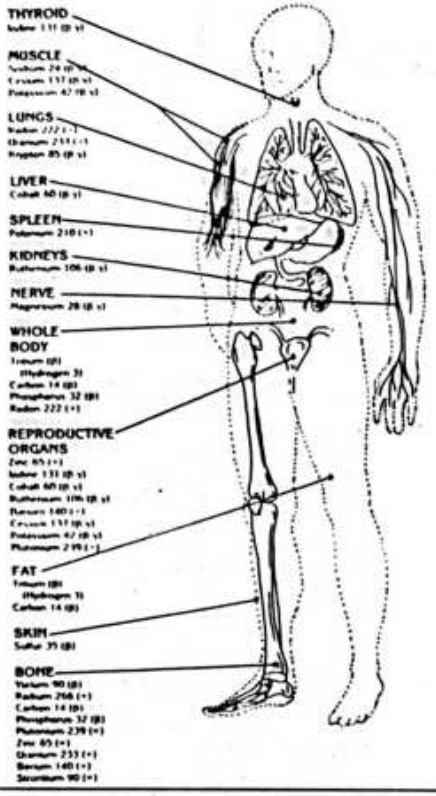
'The highest dose rates recorded are at Berkeley where an individual member of the public in the vicinity of the station could in recent years have received doses up to 2 msv per year from this source'.(3)

Critical Groups

'Critical groups' within the communities near nuclear installations will receive higher doses than that implied by the average dose as a result of exposure through specific pathways.(4) In the case of Berkeley and Oldbury this is assumed to be through the consumption of locally caught fish and shell fish and occupancy of the intertidal mud areas by the local fishing community.(5)

Also of significance is the type of radiation which the nuclear industry produces. Discharges include isotopes which are alpha beta and gamma emitters - all forms of ionising radiation which is capable of damaging the material through which it passes or comes into contact.

RADIATION
AND YOU



Internally deposited radioactive elements will keep bombarding surrounding tissues until the body removes them (e.g. through the urine) or until they are no longer radioactive (stable). The length of time it takes for half of the original radioactive material to become stable is called the half life. For a rough approximation of the length of time the element will be radioactive, multiply the half life of the element by 10.

Table 1

ISOTOPE	RADIATION EMITED	HALF LIFE
Uraninum 233	Alpha	162,000 years
Plutonium 239	Alpha	24,000 years
Carbon 14	Beta	5,600 years
Cesium 137	Beta, gamma	30 years
Strontium 90	Beta	28 years
Tritium (Hydrogen 3)	Beta	12.26 years
Krypton 85	Beta, gamma	10 years
Cobalt 60	Beta, gamma	5 years
Radium 266	Alpha	620 days
Ruthenium 106	Beta, gamma	1 year
Zinc 65	Gamma	245 days
Polonium 210	Alpha	138 days
Sulfur 35	Beta	87 days
Phosporus 32	Beta	14 days
Barium 140	Gamma	13 days
Iodine 131	Beta, gamma	8 days
Radon 222	Alpha	3.8 days
Yttrium 90	Beta, gamma	64 hours
Magnesium 28	Beta, gamma	21 hours
Sodium 24	Beta, gamma	15 hours
Potassium 42	Beta, gamma	12 hours

Courtesy of Friends of the Earth

Alpha Particles have a short range in the air and can be stopped by a sheet of paper. They cannot penetrate unbroken skin. If alpha emitting isotopes are taken into the body by breathing, swallowing or through cuts, damage can occur to the soft tissue, particularly to the sensitive bone marrow. An alpha particle is 20 times more damaging inside the body than the same dose of gamma radiation.

Beta Particles are faster moving and vary in penetrating power. They can be stopped by a thin metal sheet and thick skin tissue. Beta particles can produce skin lesions - known as beta burns. Like alpha particles they can be particularly damaging to soft internal tissue.

Gamma Rays are very penetrating and can pass straight through the body. Very thick metal or concrete is needed to give protection. They cannot be injested or inhaled.

The largest source of man made radiation (11.5%) comes from the use of X rays (similar to gamma rays) and radio therapy. Both carry with them risks which are accepted for the potential benefits of the treatment.

However, up to 1400 cancers and 600 cased of genetic damage are caused each year from diagnostic radiology.(7)

The treatment for one type of cancer may cause another cancer to develop elsewhere in the body.

Research in the 1950's and 60's by Dr. Alice Stewart revealed that there was a higher incidence of cancer in children whose mothers had been X rayed while pregnant. Doctors are advised to regard women as pregnant for X ray purposes unless there is evidence otherwise.

The mass X ray programmes were stopped because of the increased cancer risks and children 's feet are no longer measured by X ray machines for the same reason.

Radiation is Dangerous Radiation is dangerous because it is capable of damaging and changing cell structure to produce cancers and genetic damage. There is no entirely safe thresh hold below which radiation exposure is safe.(8)

Different degrees of cell damage can take place as a result of radiation exposure:

i) Cells will remain undamaged
ii) Cells will be damaged, but repair themselves correctly
iii) Cells will be killed but if not too many, they will be eliminated and the body will continue to function as before. If sufficient cells are killed to prevent an organ from functioning then depending upon the severity of the damage, death may occur.
iv) Cells will be damaged and will repair themselves incorrectly. The damaged cells will continue to reproduce themselves in their deformed state possibly forming cancers. If the damage occurs in the reproductive organs, genetic damages may occur in future generations.

The types of cancer which develop depends upon the location of the damage. If it is in the bone marrow, leukaemia can result, in the lymph glands, cancers such as Hodgkins Disease; in the thyroid gland, thyroid cancer. If however, the reproductive organs are affected then genetic damage can occur.

In addition certain isotopes tend to concentrate in particular parts of the body giving rise to specific types of cancer.

The long latency period between being irradiated and the damage becoming apparent in the form of cancers or genetic damage can be anything from 2 - 40 years. This makes any connections very difficult to prove - especially if there is no desire to accept responsibility.

The families of 3 BNFL workers at Sellafield who died of cancer in the late 1960's and early 1970's have only just been awarded conpensation under a new joint company and union scheme. Five previous claims were settled out of court only after very lengthly proceedings. Although the new scheme is intended to speed up the compensation claims, there are up to 50 cases still outstanding.

References

1 Dr. Alice Stewart 1986

2 NRPB 173 1984 Table 10. Annual collective dose to UK population from airborne effluent discharges.

3 NRPB 173 1984 Page 18

4 NRPB 173 1984 Table 14. Critical group dose from liquid effluent discharged from nuclear installations in 1982

5 MAFF Environmental Monitoring Reports

6 NRPB 173 1984 Fig. 8 The Composition of the total radiation exposure to UK population.

7 Radiation & Health Information Service: Health risks from Ionising Radiation Exposures given During Medical Diagnostic Procedures in Britain. 1985

8 NRPB Living with Radiation 1983.

Radiation Dose Limits

Radiation Dose Limits

Maximum allowable levels of radiation to the public and workers in the nuclear industry are set by the government, based on recommendations from the National Radiological Protection Board (NRPB) and the International Commission on Radiological Protection (ICRP). These 'safe' levels contain risk factors which accept that a number of fatal cancers will occur from exposure. Non fatal cancers are not included in this assessment.

Both the ICRP and NRPB have a majority of their members heavily committed to the nuclear industry. The director of the NRPB, Mr. John Dunster, was formally a senior employee of BNFL, hardly an impartial advisor.

Medical and scientific opinion on 'safe' radiation levels has,over the years, changed many times, always towards lower levels and still remains controversial.

UK Public Dose Limits

Year	Dose
1952	15 msv per year
1957	5 msv per year
1986	1 msv per year, 5msv max, 70 msv lifetime dose

UK Occupational Dose Limits

The assessment of 'safe' dose limits for the average population from low level radiation is based mainly on the effects of exposure to high levels, particularly the 'A' bomb survivors and medical exposures. However, there is no concensus of scientific opinion and the US Academy of Science, BIER III report, and the U.N. Commission, UNSCEAR, suggest that the ICRP underestimate low level radiation effects by between 2 and 10 times. The Black Report comments that 'There is no evidence from human exposure for the Leukaemogenic dose to young people from chronic exposure to such radionuclides, all presently available evidence having been collected from acute exposures and most frequently from exposures to gamma rays".(1)

Dose limits to the public, other than from direct radiation, are based on pathways to man through the food chain. This is how the Chernobyl fall out lead to the banning of lamb sales from parts of Britain. However, criteria for banning food sales may vary between countries for reasons of radiological protection or politics. For example, the EEC action level for radiation in meat is 1000 Bq/kg, yet 600 Bq/kg is applied for imported meat.(2) Some countries apply lower levels still. In Britain the highest level is used and meat approaching 1000 Bq/kg can still be sold.

When applying dose limits to the design and operation of nuclear power stations, decisions are made on discharges, thickness of materials for shielding etc., on the principle of making radiation doses 'as low As Reasonably Achievable' ALARA. This approach was challenged recently by the Commons Select Committee studying Sellafield and recommended the adoption of As Low As Technically Achievable' ALATA. If applied this principle would have the effect of reducing discharges from nuclear power stations to to such a level that they may have to cease operating. the recommendation was rejected by the Government.

Technical improvements in design have left Berkeley far behind. The exposed cooling ducts which emit gamma radiation are enclosed at Oldbury, with consequentially lower doses.(3)

Berkeley has an annual authorised limit for liquid discharges double that of Oldbury and 5 times that of Trawsfynydd.(4) If the ALATA principle were applied, radiation doses to people living near the Severnside nuclear power stations could be considerably reduced.

SCAR concludes that	i) Even very low levels of radiation can have an adverse effect on health and there is no entirely 'safe' dose. ii) The Nuclear Industry operate within so called 'acceptable' levels at which they consider the benefits derived justify the risks. Many radiobiologists believe that these levels are set far too high. iii) The Government has refused to implement the latest recommendations by the NRPB to reduce the permitted dose to the public from 5 msv per year to 1 msv per year. iv) The risk posed by present permitted dose levels is not acceptable.
SCAR recommends that	when monitoring discharges and critical group doses, the Council and Health Authority should consult independant scientific opinion and apply the lowest recognised dose limits, rather than unquestioningly accepting the official government position.

References

1) Black Report
2) Private correspondence with NRPB 15.8.86
3) Berkeley and Oldbury Environmental Monitoring Reports
4) MAFF Environmental Monitoring Reports

Incidence of Childhood Leukaemia in Gloucestershire

The study considers rates of leukamia and lymphomas (diagnostic codes 200 - 208) in individual and adjoining parishes within Gloucestershire, in children under 15 years of age, between 1971 and 1985.

Statistical Data Source

The statistics used have been based on those obtained from the Cancer Registry, with the addition of further cases discovered through local ascertainment.

Expected Rates

In order to standardise the analysis for the County as a whole, all comparisons of actual with expected rates have been based on the National Expected Rates for the particular age groups and diagnosis. Expected rates are derived from Cancer Registry registration rates. The recent epidaemiological study of cancer in West Cumbria did not adjust Expected Rates to account for further cases discovered through local ascertainment.(1) For consistency, no adjustment has been applied in this study.

Some cases may still exist which are not known to the Gloucester Area Health Authority, particularly in those areas to the East of Cheltenham Area Health Authority. Every effort has been made to discover all the cases in these areas, and any shortfall cannot be very large.

Time Periods

A fixed time period of five years was selected, since this is considered to be the minimum time period necessary to give reasonable assessment of probability (Black Report 1984). A shorter period could indicate an overselection of data, while a longer time span would devalue the statistical significance of any concentration of cases below a level which reflects public concern. A period of over five years could be investigated to compare overall statistical significance. In any area which is affected by radioactive discharges, a short time period must be used so that any significant fluctuation from the expected cancer rates can be identified and investigated.

Areas

Individual and adjoining parishes within the Sub Areas of the Gloucester Area Health Authority have been considered for comparison. Only by plotting the actual parish of each case for comparison with its neighbours, can any true assessment be made of the significance of any clustering which may emerge. The selection of much larger areas ie. sub areas or whole counties, results in an averaging of data which hides its real significance.

Small Area Statistics

The Black Report concludes that the study of small areas over limited time periods is necessary 'in demonstrating the high rate of leukaemia in young

people in the area' since 'radiation is the only established environmental cause of leukaemia within the limits of present knowledge'.

It is appreciated that the study of small numbers of cases in small areas over short periods of time makes any statistical analysis vulnerable to distortions through the use of incorrect data. However, it is considered essential, both for this study and for future monitoring of health statistics, that the significance of concentrations of diseases are accurately located and assessed, and not lost in averages, as so often happens in an attempt to allay justified concerns.

Childhood Leukaemia and Lymphoma in the Forest of Dean

Thirteen cases of leukaemia and lymphoma in children under 15 years of age were diagnosed in the Forest of Dean, between 1971 and 1983.

Six of these cases - four acute lymphatic and two Hodgkins Disease - were diagnosed between 1979 and 1983. All were children under eight years old and lived in the riverside parishes near Lydney.

GEOGRAPHICAL DISTRIBUTION OF LEUKAEMIA AND LYMPHOMA IN CHILDREN UNDER 15 IN THE FOREST OF DEAN BY PARISH. 1971-1985

Leukaemia and Lymphoma Cases in Children Under 15 years in Forest of Dean by Sub Area and Parish 1971 - 1985 (incl)

Sub Area	Year	Parish	Age	Diagnosis
F1	1982	Dymock	9	Acute lymphatic
F3	1971	Cinderford	13	Leukaemia
	1974	Cinderford	6	Hodgkins Disease
	1976	Mitcheldean	12	Acute Myloid Leukaemia
F4	1972	Lydbrook	3	Leukaemia
	1977	Coleford	12	Acute Lymphatic
	1983	Coleford	14	Acute Lymphatic
F5	1979	Lydney	3	Acute Lymphatic
	1980	Alvington	7	Hodgkins Disease
	1980	Woolaston	2	Acute Lymphatic
	1981	Lydney	6	Acute Lymphatic
	1982	Tidenham	6 mths	Hodgkins Disease
	1983	Lydney	6	Acute Lymphatic

Acute lymphatic leukaemia, a cancer of the white bloodcells, is undoubtedly related to radiation. Hodgkins Disease is a cancer of the lymph glands, and can be caused by radiation.

Both diseases are very uncommon in young children. Less than 300 cases of acute lymphatic leukaemia occur each year in the 0-15 year old age group in the whole of England and Wales. Hodgkins Disease is even less common, 49 cases each year in children under 15, and only 20 cases in children under 10 throughout England and Wales.(2)

For the 1984 Health Authority report on childhood cancers in Gloucestershire(3) 1976-1983, a 24 year time period was used (1959-1983), to analysis the significance of the six Lydney Rurual District cases. According to the Report, only two other cases of childhood leukaemias were registered in the Lydney Rural District during that period - both diagnosed in 1967. The Report concluded that the four cases of leukaemia and one case of Hodgkins Disease (in fact two), in Lydney Rural District, could have occurred by chance, and that the incidence of leukaemias and lymphomas in the county as a whole was within expected levels.

However, the fact that all of the six cases occurred entirely between 1979 and 1983 is unlikely to be by chance - less than one in 5 thousand. In addition, the fact that all 6 cases were in children under 10 years, including 2 Hodgkins Disease, makes the occurrence statistically highly significant.(1 in 100,000)

Gloucester Health Authority/ SCAR Local Study

Since these facts first came to our attention, we have spent a great deal of time collecting and collating information about the incidence of childhood leukaemias, lymphomas and other cancers in Gloucestershire. Representatives of SCAR have met the Gloucester Area Health Authority Registrar in Community Medicine, Dr. James Stuart, on a regular basis, since Spring 1986.

Little analysis of the childhood cancer data available to the Area Health Authority had been carried out prior to 1984, and earlier generalised reassurances were based on incomplete information.

Our particular experience has shown that information based on Cancer Registry figures - the main source of data for the Health Authority - is not necessarily complete, due to inadequacies of the present system of recording and registering cancer cases.

Cancer Registrations in Gloucester Health District

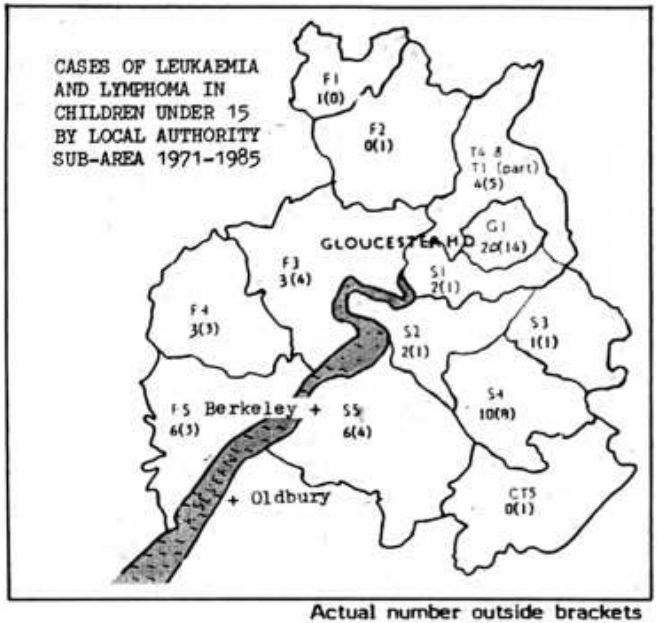
Recent investigations have revealed a shortfall of up to 30% in Cancer Registry data for childhood leukaemia and lymphoma cases in Gloucester Health District.

Previous Gloucester Health Authority reports were based on incomplete Cancer Registry data when calculating the significance of the incidences of childhood cancers in the county.

Caes of Leukaemia and Lymphoma in Children under 15 years by Sub Area 1971-85 in Gloucester Health District

Sub Area	Cancer Registry	Local Ascertainment	Total	Expected No. of cases*
G1	17	3	20	14
F1	1	-	1	-
F2	-	-	-	1
F3	3	-	3	4
F4	3	-	3	3
F5	4	2	6	3
S1	1	1	2	1
S2	2	-	2	1
S3	1	-	1	1
S4	5	5	10	8
S5	4	2	6	4
CT5	-	-	-	1
T1/T4 (part)	1	3	4	5
TOTALS	42	16	58	46

* Derived from 1981 National Registration rate of 49.2/million.



Actual number outside brackets
Expected number inside brackets

Childhood Leukaemia and Lymphoma in Gloucestershire

Using the same criteria as before, we extended our study to the whole of the county area for analysis and comparison with Lydney Rural District.

Investigations revealed that the majority of cases were to the West of the county and that four sub areas within Gloucestershire had a higher then expected rate of Acute Lymphatic Leukaemia (204) and Hodgkins Disease (201). Again, it was necessary to locate the cases accurately by parish, to determine their significance. The statistical significance of the number of cases within these sub areas and parishes is set out below, with their geographical distribution.(see overleaf)

It is interesting to note that while Gloucester (G1) appears to have a high rate for all leukaemias, it is, in fact much less statistically significant than the 5 riverside Lydney parishes. This illustrates the danger of ignoring seemingly small numbers for the more immediately impressive larger values.

The results of the study show that the incidence of all childhood leaukaemias and lymphomas in Gloucestershire during the period 1971-1985 is mainly concentrated in the Severn Valley and its adjacent hills. Within this region there are sub areas - F5(Lydney); S4 (Stroud) and G1 & part T4 (Gloucester) - each containing groups of adjoining parishes which show a statistically significant incidence of these particular cancers. Of even greater significance is the incidence of Lymphoid Leukaemia and Hodgkins Disease in these same areas.

OBSERVED AND EXPECTED RATES OF LEUKAEMIA AND LYMPHOMA IN CHILDREN AGED 0-14 IN GLOUCESTERSHIRE FROM 1971 TO 1985, BY HEALTH AUTHORITY SUB-AREA

GLOUCESTERSHIRE PARISHES WITH GREATEST INCIDENCE OF LYMPHOID LEUKAEMIA & HODGKIN'S DISEASE IN 0 - 14 AGE GROUP, 1971 - 1985 IN ORDER OF PROBABILITY

PARISHES	0 - 14 POPULATION	DIAGNOSIS AND NO. OF CASES	YEAR OF DIAGNOSIS	TOTAL IN 5 YEARS	EXPECTED IN 5 YEARS	EXCESS OVER EXPECTED RATE	POISSON PROBABILITY
Riverside Parishes from Lydney to Tidenham	3,160	4 LL 2 HD	1979,1980,1981,1983 1980,1982	6	0.5	1100%	P = 0.00001 1 in 100,000
Stroud Rodborough	4,889	3 HD	1982,1983	3	0.15	2500%	P = 0.0005 1 in 2,000
Gloucester Churchdown & Hucclecote	21,483	10 LL 1HD	1974,75,76,77,78	11	3.49	315%	P = 0.0009 1 in 1,100
Lydney	1,549	3 LL	1979,1981,1983	3	0.2	1400%	P = 0.001 1 in 1,000
Stroud Rodborough KingsStanley	5,369	2 HD 1 LL, 1HD 1 LL	1982 1981,1983 1983	5	0.87	600%	P = 0.002 1 in 500
5 Riverside parishes from Lydney to Tidenham	3,160	2 HD	1980, 1982	2	0.07	2600%	P = 0.002 1 in 500
Stroud	4,523	2 HD	1982	2	0.11	1800%	P = 0.006 1 in 170

* Data & Probabilities courtesy of Gloucester Health Authority

Comparative Assessments by SCAR

GLOUCESTERSHIRE PARISHES WITH GREATEST INCIDENCE OF ALL LEUKAEMIAS & LYMPHOMAS IN 0 - 14 AGE GROUP, 1971 - 1985, IN ORDER OF PROBABILITY

PARISHES	0 - 14 POPULATION	DIAGNOSIS AND NO. OF CASES	YEAR OF DIAGNOSIS	TOTAL IN 5 YEARS	EXPECTED IN 5 YEARS	EXCESS OVER EXPECTED RATE	POISSON PROBABILITY
5 riverside Parishes from Lydney to Tidenham	3,160	4 LL 2 HD	1979,1980,1981,1982 1980,1982	6	0.78	800%	P = 0.0002 1 in 5,000
Gloucester Churchdown Hucclecote	21,483	8 LL, 1HD 1 LL 1 NHL,1LL,1LS	1974 to 1977 1977 1976 & 1978	13	5.25	250%	P = 0.003 1 in 330
Lydney	1,549	3LL	1979,1981,1983	3	0.38	800%	P = 0.007 1 in 140
Stroud Rodborough Kings Stanley	5,369	2LL 1LL, 1HD 1LL	1982 1981,1983 1983	5	1.32	380%	P = 0.01 1 in 100

Data & Probabilities courtesey of Gloucester Health Authority

Comparative Assessments by SCAR

In case we are accused of choosing these collections of parishes to augment their clustering effect, we would emphasise that we have deliberately looked for the worst case scenarios in all other areas within Gloucestershire for comparison. However, none of these areas have produced incidences to compare with those around Lydney. The tables in this report are for the areas with the greatest stistical significance.

Comparison of Probabilities for
All Leukaemias and Lymphomas
(National expected rate 49.2/million/year)

Area/Parish	Probability
1. Lydney & riverside parishes	0.0002 = 1 in 5,000
2. Gloucester area	0.003 = 1 in 330
3. Lydney	0.007 = 1 in 140
4. Stroud area	0.01 = 1 in 100

Comparison of Probabilities for
Lymphoid Leukaemia and Hodgkins
Disease
(National expected rates
27.65; 4.86/million/year individually,
32.5 combined)

Area/Parish	Probably
1. Lydney & riverside parishes	0.00001= 1 in 100,000
2. Stroud area	0.0005 = 1 in 2,000
3. Gloucester area	0.0009 = 1 in 1,100
4. Lydney	0.001 = 1 in 1,000

Comparison of Probabilities of
Hodgkins Disease
(National expected rate 4.86/million/year)

Area/Parish	Probability
1. Stroud area	0.0005 = 1 in 2,000
2. Lydney & riverside parishes	0.002 = 1 in 500
3. Stroud	0.006 = 1 in 170

To Summarise

The occurrence of such unlikely events, particularly in the case of Lydney and adjoining parishes, should be a matter of great concern to us all.

Since radiation is the only known cause of childhood leukaemia, the close proximity of the nuclear power stations to these areas cannot be overlooked if we are seeking to account for the occurrence of such unlikely events.

That people have a need, and a right to know is happening to them is a concept that the Nuclear Industry finds all too easy to dismiss with patronising justifications. Their attitude is best summed by the following.

'You asked me how best to respond to someone who said that they believed that a particular case of leukaemia might be in whole or in part due to radiation from Berkeley Nuclear Power Station. This is a very difficult question to answer because there is a natural tendency for people to want to attribute domestic adversity to an identified cause. It seems to give some comfort to people to believe there is a reason rather then blind statistics. In these circumstances, the giving of reassurance is an uphill task'.

(Letter from John Dunster, Director of the National Radiation Protection Board, to Paul Marland, MP for West Gloucestershire, December, 1984).

It is unlikely that an undisputed link between the nuclear facilities and the incidence of childhood leukaemia will ever be made. However, the possibility remains, and wherever there is a doubt, we must always err on the side of caution to ensure our safety. To dismiss the possibility of such a link, and its inevitable consequences, would show a lack of concern for the health of the community.

SCAR concludes that

The probability of the six Hodgkins and leukaemia cases children under 14 in the Lydney area occurring by chance is .00001 (one in 100,000). This is highly significant statistically. One must therefore look for an environmental cause. Radiation is the only recognised environmental cause of childhood leukaemia.

There are three other areas in the Gloucester Health District which have significally higher than expected rates for leukaemias and lymphomas in the 0-15 age group, and these require further investigation.

Although the whole of the Gloucester Health Authority lies within 30 kilometres of Berkeley and Oldbury nuclear power stations, data concerning radiation linked diseases in children up to 15 years has never been examined in such detail by the Health Authority until the recent joint study initiated by SCAR.

Cancer Registry statistics, from which the Gloucester Health Authority has in the past, drawn its information, has been found to be incomplete for the county by as much as 30%. A more accurate and reliable system of recording cases in the Gloucester Health Authority must be established as part of a continuing comprehensive radiation and health monitoring programme.

The information supplied to the Health Authority through the Liaison Committee, regarding liquid and airborne discharges, has not been sufficiently detailed or up-to-date enough for the Health Authority to be aware of the actual amounts and types of discharges. Considering the potential carcinogenic and lethal nature of such discharges, the present lack of liaison and information would not seem to be in our best interests.

SCAR recommends that

i) More resources be made available to Gloucester Health Authority to develop a comprehensive system for collecting and collating radiation and health data which will enable early identification and investigation of any deviation from expected rates.

ii) Gloucester Health Authority should continue and expand the in-depth analysis of cancer cases begun at the instigation of SCAR.

iii) Results of all proposed investigations should be passed to the County Scientific Office (see recommendation chapter), who should also have full details of radiation discharges. This Officer should report to the Public Protection Committee meetings on a regular basis, with recommendations where appropriate.

iv) Gloucester Health Authority must be given more regular up-to-date comprehensive data concerning discharges from Berkeley and Oldbury nuclear power stations, than that which is at the moment provided annually for the Local Liaison Committee meetings.

References

1) Black Report.
An investigation of the possible increased incidence of cancer in West Cumbria. Report of Independant Advisory Group 1984.

2) Registration Rates, OPCS

3) Gloucester Health Authority:
Incidence of some cancers in Gloucestershire. 1984

Postscript (March 1987)

Gloucester Health Authority received a report from Dr. James Stuart in January 1987, which accepted the significance of a Leukaemia cluster in the Lydney area.

The Department of Community Medicine is to set up a new comprehensive computerised system for logging all cancers in children so that future trends can be easily examined.

SCAR wholeheartedly welcomes this development.

Accidents

In a letter to Lydney Town Council, Dr. John Bishton, Manager of Berkeley Power Station, said "there has never been an inadvertent leak of radiation at Berkeley or Oldbury".

This is misleading, because there have been incidents over the past few years which did lead to leakage of radio active substances, some of which could have led to serious accidents of endangered the workforce and families.

These are some of the incidents which occurred between 1976 and 1981. The information is taken from public documents compiled by the Nuclear Installations Inspectorate.

DECEMBER 1976, OLDBURY
A leak in the ancillary pipework of the spentfuel element cooling pond. The leak was isolated, but contaminated water had leaked to the ground.

MAY 1977, BERKELEY
A grab failed to engage properly on a fuel element during a refuelling operation.

JULY 1977, BERKELEY
The overheating of electrical wiring caused a small fire.

JULY 1977, OLDBURY
A fire started in a corner of the incinerator compound, burning some plastic bags containing clean clothing and incinerator ash.

AUGUST 1977, OLDBURY
A fire developed in turbine lagging which had become soaked with oil.

DECEMBER 1977, BERKELEY
A photographic survey of an active waste storage vault revealed the presence of part of a spent uranium fuel element.

AUGUST 1978, BERKELEY
A leak from a pipe flooded an open inspection chamber and spilled on to the surrounding ground. The location of the spillage is outside the reactor area but within the site boundary fence. Very low levels of contamination were detected in the soil over the immediate area.

AUGUST 1978, BERKELEY
A small fire occurred in one of the sealed facilities used for the examination of irradiated magnox fuel. The fire was quickly dealt with, but slight damage to a manipulator seal caused a small breach of the facility's containment.

OCTOBER 1978, BERKELEY
Smoke was observed arising from oil-soaked lagging on the steam pipe of one of the main turbines. The local fire brigade was called to remove the smouldering lagging, assited by the station fire team, and an outbreak of fire was prevented.

AUGUST 1979, OLDBURY
A small radioactive particle was detected in a joint between wooden blocks in the floor of an unclassified area.

SEPTEMBER 1979, OLDBURY
An area of radioactive contamination was found in a bitumastic expansion joint between concrete road slabs.

MAY AND JUNE 1980, BERKELEY
Four small areas of radioactive contamination were found fixed into the road surface on a roadway adjacent to the spentfuel element cooling pond.

AUGUST 1980, BERKELEY
A small particle of radioactive contamination was found fixed in a carpet tile in the main laboratories reception area.

SEPTEMBER 1980, BERKELEY
Five small spots of radioactive contamination were found fixed to the surface of a roadway in an area adjacent to the spent-fuel element cooling pond.

NOVEMBER 1980, BERKELEY
Weld defects found in the bellows restraint structures of Reactor One were the subject of Parliamentary Questions.

JANUARY 1981, BERKELEY
In removing some pipework of a disused line, a pipe which was contaminated internally, was partially exposed during excavations. The soil adjacent to the old pipeline and 25 cubic metres were removed.

JUNE 1981, BERKLEY
Routine monitoring of a lorry revealed radioactive contamination on a piece of timber and scafford board.

SCAR regards present methods of informing the community of any incident, and possible environmental and radiobiological consequences as totally inadequate.

SCAR recommends :

i) That in the event of an incident, the public are informed immediately.

ii) Precise details of the incident should be given.

iii) A complete breakdown of the isotypes, types and quantities to be given should there be an inadvertent release of radioactive substances.

iv) This information should be made immediately available to the Health Authorities and appropriate officers of Gloucestershire, Gwent, Somerset and Avon County Councils.

Postscript (March 1987)

On the same day as the Gloucestershire County Council Seminar for which this report was originally prepared, a fire took place in a 'cave' for handling spent fuel at Berkeley Nuclear Laboratories. An automatic extinguishing system put out the fire in the fuel rod, which had spontaniously ignited whilst being remotely handled. 75 k Bq (2 μ Ci) of radioactivity escaped into the atmosphere through the 'cave' filters. BNL say that this material is prone to self-ignition and precautions are taken to ensure quick extinguishing of any fire.

SCAR are concerned that the filters failed to prevent radioactive material from being allowed to escape from this predictable incident. Local people ringing BNL were initially told that no such incident had taken place. The press were only told after the situation had been made safe.

SCAR is concerned that in the event of an accident, secrecy is the first instinct of the CEGB, rather than immediate public information.

Emergency Plans

Emergency Plans for Berkeley and Oldbury

The Chernobyl accident has brought home to us that the unthinkable can happen. Like Chernobyl, Berkeley and Oldbury have uranium/graphite cores and like Chernobyl, both local power stations have no secondary containment vessel.

Maximum Credible Accident

Also in common with Chernobyl is the concept of a maximum credible accident (MCA). In order to obtain a license to operate, the CEGB has to show that it can deal adequately and safely with what is considered to be the worst possible combination of events which could credibly give rise to an accident. Plants have to be so designed that in the event of the MCA, any consequential release of radioactivity could not cause significant harm to the public. The assessment of what constitutes an MCA is therefore essential to effective safety planning. It must be stressed that this is a subjective evaluation. Even the CEGB concede that it would be possible to construct a senario which would result in an accident with consequences more severe than those of the MCA, but a value judgement is taken concerning the chance of such an occurence at any individual nuclear power plant. This was recognised by the influential Flower's Report which 10 years ago concluded that any chance of an accident cannot and must not be ignored.

There are conflicting scientific opinions as to what the MCA is in the case of Berkeley.

The CEGB considers it to be a gradual loss of coolant through a slowly enlarging crack in a cooling duct. The time factor would allow for control rods to be inserted into the reactor to prevent a melt down of the core, and the only contamination would come from the mildly radioactive gas escaping.

The opposing view, however, is that the loss of coolant could be much quicker causing rapid depressurisation, and rupturing of the refueling channels. In such a situation the insertion of cooling rods to stop the reactors would be prevented. Boron (fitted to the reactor as a later addition) would then be dropped into the channels in an attempt to prevent the situation developing into another Chernobyl type disaster.

Considering the discrepancy between these views it would not appear to be in the public's best interest that it is the operator's (CEGB) concept of an MCA which prevails and which determines the nature and extent of their emergency plans.
Consequently no provision is made for anything but a 'minor' accident, and even these provisions are so derisory that they reveal an inability for the CEGB to contemplate anything seriously going wrong at one of their nuclear power stations.

Evacuation Plan

The local emergency plan was originally drawn up with an evacuation plan for Berkeley of 2km. In the event of an accident the police would have the responsibility of removing all those 'downwind' of the reactors. The local authority would have the responsibility of providing the evacuees with shelter. Moreover, the police would have the responsibility of distributing the famous potassium iodate tablets in a wider area, which would help minimize the risk of developing thyroid cancer, caused by exposure to Iodene 131. They have to be taken shortly after exposure. When asked, Lydney police did not know that they had supplies in their police station, or how they could distribute them.

These plans have been recently revised, presumably because they have been shown to be a cosmetic rather than a real attempt to deal with an accident. This revision of plans has extended the evacuation zone to a 3 km radius as it was pointed out that the previous smaller area cut through the centre of Berkeley - one half of the town would have been evacuated but the other would have been left. The evacuation zone now includes a small area on the Forest of Dean side of the River. The other change appears to restrict the issue of potassium iodate tablets to those who are evacuated.

The lack of serious planning that goes into the emergency plans is further shown by the way in which they are tested. The major test of any evacuation provision is whether or not it is possible to safely move those people at risk in as short a time as possible with minimum panic, injury etc. Present emergency exercises take place in secret. The Environmental Health Officer for the Forest of Dean recently refused to reveal to his Committee any details of the emergency exercise planned for this year on the grounds that public knowledge might prejudice its success.

How would the emergency services cope with an accident on the scale of Chernobyl? However remote that possibility.

SCAR considers that the premise of the MCA on which current emergency plans are based is inadequate and that the attitude that 'it could not happen here', breads a complacancy that makes the aftermath of any accident at Berkeley or Oldbury even more threatening to people in the area. SCAR contends that existing emergency plans are not only inadequate but even in their own terms, are unlikely to work without the co-operation and involvement of the public and SCAR has serious doubts as to the ability of emergency services, such as the police, fire brigade and hospitals to cope with the effects of an accident.

SCAR recommends that:

i) Adequate provisions be made in The Emergency Procedures to cater for the successful evacuation of people within a radius of at least 25 miles from each of the nuclear power stations.

ii) Adequate supplies of Iodene tablets should be stocked at key points within a 25 mile radius of each of the nuclear power stations. Plans for the effective distribution of the tablets must be included in the Emergency Procedures.

iii) All Emergency Services should be specially trained to cope with a major radiation leak and supplied with protective clothing. Local hospitals should have adequately equipped decontamination units capable of dealing with the casualties of such a leak.

iv) All communities within a 25 mile radius should be given details of the emergency plans. Special provision should be made to ensure the safety of the large number of school children within the 25 mile radius.

v) A public education programme initiated by the County Emergency Planning Department should be implemented to inform people of what the emergency procedures are and how they would be warned of any 'emergency situation'. This could possibly be done through a pamphlet sent to all county householders.

Postscript
(March 1987)

On 6th February 1987, a railway wagon carrying a full spent fuel flask was derailed in a siding at Gloucester. This was the second such incident at Gloucester. In both events local people were not immediately told of the potential danger. Railway workers had to wait the arrival of emergency CEGB staff. Firemen from the Stroud based Chemical Incident Unit were the only ones to put on protective clothing and breathing apparatus.

The flask contained highly radioactive spent fuel from Oldbury and was being shunted into a siding at Gloucester, to await the arrival of further flasks from west country nuclear power stations, before travelling to Sellafield for reprocessing.

The sidings are close to houses and during overnight storage the flasks are not guarded and could become targets for vandalism or even terrorists.

SCAR is concerned that this incident could have been a disaster if the flask had been hit by a passing passenger train and had leaked.

SCAR welcomes the City Councils decision to hold an enquiry into the incident.

Decommissioning

The CEGB's plans for the future of their nuclear power stations are vague and ill-defined. Berkeley is now 25 years old, Oldbury 19 years old, Hinkley 'A' 22 years, and Hinkley 'B' 10 years. Each station has a biannual safety review upon which future functioning is dependent. Moreover, the NII undertakes a 20 year safety review. In the case of Berkeley, this was started in 1982 and has yet to be completed, and the CEGB have said that the report is unlikely to be made public as it would be:

(a) incomprehensible to those outside the industry

and

(b) provide too much ammunition to those opposed to nuclear power.

SCAR believes that documents such as this are so vital for the future safety that they should be made public in full.

It was thought that the early power stations were built with a 20 year life and presumably, as with any civil engineering project, these stations have a design life which, when reached, must have special implications for their safety. Currently,the CEGB deny that the Severnside power stations have a planned life, and have been saying that their 'true' life should be computed from the actual times when the power stations are operating. Hence the least reliable and more accident prone reactors have the longest life.

But sometime, hopefully soon, the local stations will have to be closed down. But when? Again the CEGB's plans are both vague and simplistic. They claim the decommissioning process is simple. It is broken down to three stages:

1. Removal of fuel rods - to ponds for cooling prior to reprocessing.
2. Removal of all equipment and machinery.
3. Leaving the 'biological' shield for up to two decades until it is safe to dismantle.

While SCAR believes that decommissioning has to be undertaken, it also believes these plans are inadequate for the following reasons:

(a) They involve the use of cooling ponds in which radio-nucleides accumulate, and which have, to date, been responsible for the largest releases of radio-activity in the locality. It is possible to 'dry store' rods, as have been done at Wylfa for the past

14 years, thus reducing the potential environmental damage.

(b) The biological shield consists of many tons of metals and concrete, which are highly contaminated. Detailed plans for eventual dismantling must be published to ensure that the highest priority is given to environmental protection.

(c) Unlike newer nuclear power stations, Berkeley was designed with no real thought of decommissioning, and this increases the problems of actually dismantling and removing irradiated materials.

(d) Hitherto, little attention has been focused on the environmental effects along nuclear transport routes. Decommissioning obviously, makes such monitoring even more necessary.

SCAR's fear is that the CEGB will continue to postpone consideration of decommissioning - thus putting off the inevitable and increasing the long term adverse health effects on our community.

The 'Green Field' decommissioning plans of the CEGB involve the dismantling, transportation, and subsequent long-term storage elsewhere of vast quantities of highly radioactive material.

Possible alternatives to this potentially dangerous - and as yet untested method of decommissioning should therefore be given serious consideration.

SCAR calls for:

i) A public enquiry into when and how to decommission the nuclear power stations.

ii) Environmental consequences and the health effects on local communities be given priority consideration in any decommissioning plans drawn up.

iii) Berkeley, because of its age, to be the first nuclear power station in Great Britain to be decommissioned.

We also recommend that Berkeley is developed as a 'centre of excellence' for decommissioning technology. The proximity of Berkeley Laboratories would facilitate this.

Conclusions

Nuclear Power on Severnside

There are 4 Nuclear Power stations on the Severn Estuary. This is the highest concentration of Nuclear Installations in Western Europe.

The whole of Gloucestershire falls within a 30 mile radius of Berkeley and Oldbury stations.

At 24 years of age Berkeley is the oldest Civil Nuclear Station in the UK. It's design would not be given a licence today.

SCAR calls for no more nuclear development on Severnside.

SCAR calls for the immediate closure of Berkeley.

Radioactive discharge and monitoring

Every day radioactive waste is being discharged into the River Severn and into the air by all 4 nuclear power stations on the Severn.

The discharge limits are set with regard to plant operation and not the environment.

Berkeley and Oldbury, being only 4 miles from each other have a combined effect on the environment.

The combined liquid discharges of Berkeley and Oldbury have exceeded the Berkeley discharge limit in 1977, and the Oldbury discharge limit on 3 occasions.

The monitoring done by MAFF and CEGB of liquid discharge is insufficient and not related to discharge amounts. There are no limits on the amount of radiation allowed to be discharged into the air.
There have been very high levels of radiation recorded at Berkeley's perimeter fence.

SCAR demands intensive, independant monitoring of the environment around the Nuclear Power Stations in Gloucestershire with the results made easily accessible to the public. They should be analysed by a County scientific officer. The monitoring must be continued throughout the decommissioning programme.

Radiation Dose Limits and Health

Even very low levels of radiation can have an adverse effect on health and there is no entirely safe dose.

The Nuclear Industry operates within so called 'acceptable' levels at which they consider the benefits derived justify the risks. Many Radiobiologists believe that these levels are set far too high. The Government has

refused to implement the latest recommendations of the NRPB to reduce the permitted dose to the public from 5 msv per year to 1 msv.

SCAR does not accept that the risk posed by the present permitted dose limit is acceptable.

SCAR recommends that GCC and GHA seek independant scientific opinion and apply the lowest dose limits when monitoring discharges and critical group doses.

Health Statistics

There is a cluster of childhood leukaemias in and around Lydney. All of the 6 children were living within 4 miles of Berkeley or Oldbury power stations.

- All 6 children were diagnosed at under 8 years. The probability of this number of child leukaemias occuring by chance is 1 in 5,000
- One therefore must look for an environmental cause. Radiation is the only known environmental cause of childhood leukaemia.
- There has never been co-ordination of data concerning radiation linked diseases in Gloucestershire although the whole of the health authority lies within 30 kilometers of the 2 power stations.

Cancer Registry statistics have been found to be incomplete by as much as 30%

SCAR recommends that more resources be made available to Gloucestershire Health Authority to enable them to develop a comprehensive system for collecting data and to enable them to identify and investigate any deviations from expected rates.

Gloucestershire Health Authority should continue the in-depth analysis of cancer cases begun at the instigation of SCAR.

Results of all investigation should be passed on to the Scientific Officer who should also have a detailed breakdown of radiation discharge levels. Regular reports to be made to the Public Protection Committee. Gloucestershire Health Authority must be given up to date information on all discharges from the power stations.

Accidents at Berkeley and Oldbury

There have been many so called 'incidents' at the stations ever since they began operations, some of which have resulted in a leakage of radioactive substances into the environment and some which could have led to serious accidents.

SCAR calls for full details of every incident to be made public immediately. Full details should be made available to appropriate officers of Gloucestershire County Council and Gloucestershire Health Authority and to all other adjoining counties.

Emergency plans for Berkeley and Oldbury

Nuclear power stations do not have ermergency plans for the worst conceivable accident as they consider it so unlikely to happen such plans are unnecessary.

For Berkeley and Oldbury, recently revised evacuation plans are for an area of only 3km radius.

SCAR considers that the CEGBs attitude to emergency planning is totally irresponsible.

SCAR proposes that communities close to the power station must me provided with detailed emergency plans

SCAR proposes that communities close to the power stations must be provided with detailed emergency plans which will be adequate in the event of an accident. Emergency services need special training and clothing to cope with a major leak of radiation and local hospitals need decontamination units. Evacuation plans should cover a 25 mile radius from each station.

Decommissioning

Although Berkeley is nearly 25 years old and thus has reached its designed life time there are no immediate plans for decommissioning. On the contrary, the CEGB continues to carry out expensive, large scale repairs and refurbishments in order to prolong its life.

SCAR believes that decommissioning should be done with the environment as the prime consideration and consideration given to alternatives to the industry's 'Green Field' plan. Due to its age, Berkeley should be the first to be decommissioned, and Berkeley Laboratories should become a 'centre of excellence' for decommissioning technology.

The workforce at Berkeley would be largely employed on a decommissioning programme and any surplus should be redeployed to work on other forms of electricity generation.

Abbreviations

C.E.G.B. Central Electricity Generating Board
M.A.F.F. Ministry of Agriculture, Fisheries & Food
E.M.R. Environmental Monitoring Report
I.C.R.P. International Commission on Radiological Protection
N.R.P.B. National Radiological Protection Board
N.I.I. Nuclear Installations Inspectorate
G.A.H.A. Gloucester Area Health Authority
S.C.A.R. Severnside Campaign Against Radiation

ACKNOWLEGEMENTS

S.C.A.R. wishes to extend thanks to:-
Dave Thorp for designing the report
Helen Andrews for typing the report
Dr. James Stuart and staff at G.A.H.A.

Revised and Updated, March 1987

Printed by Avon Friends of the Earth
Published by S.C.A.R. c/o Barbara French,
'Sherwood', The Triangle, Brockweir, Chepstow.

Further copies available, price £2 +50p Postage.