

From: Arnold Allen, C.B.E.
Member for Finance
and Administration

Telephone: 01-930 5454

30th November 1979

Dear Secretary of State,

You sent the Chairman of the Authority and BNFL a copy of your letter of the 9th November to the Chairman of the Health and Safety Commission and you said that he might wish to comment on the report of the Commission chaired by Professor Kemeny concerning the accident at Three Mile Island.

Sir John Hill discussed the matter with me, and as he has had to go to Germany before leaving for the IAEA Conference in New Delhi, asked me to reply.

Both the Authority and the Fuel Company have studied with the greatest care the stream of information arising from various sources about the accident at Three Mile Island. They have had the benefit of prompt transmission of large amounts of information from various organisations in the United States and have assessed it as it became available; their continuing dialogue with the other UK bodies concerned has also of course taken full account of this information. Now that the President's Commission has reported on its investigation of the accident, they have again taken stock of the situation.

The Commission's report is, of course, not a general study of pressurised water reactor safety but centres on an investigation - both technical and organisational - of the particular accident which was remitted for its consideration. While, therefore, the Commission's findings and recommendations are of considerable interest, the implications of them for the United Kingdom (where arrangements and practices differ in a number of ways) are necessarily indirect.

As far as institutional changes are concerned, the British position is in our view significantly different from that in the United States. The sites operated by the Authority and the Fuel Company are subject to the provisions of the Nuclear Installations Acts 1965 and 1969 and the Health and Safety at Work etc. Act 1974 (although Authority sites are exempt from formal licencing under the 1965 Act). Each site has a standing safety committee, established local emergency plans and the plants are operated by well experienced staff and backed by organisations having a thorough understanding of nuclear technology and potential accident situations.

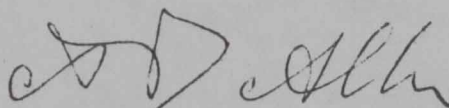
What is said in the Kemeny Report is nevertheless being studied for each site and also generally. We have noted carefully the Committee's recommendations and findings on such matters as plant instrumentation, operator training,

The Rt. Hon. D.A.R. Howell, MP,
Secretary of State for Energy,
Thames House South,
Millbank, S.W.1.

emergency arrangements and communications. We believe that there are no major deficiencies but are fully aware of the crucial importance of continuing to exercise all possible care and to ensure that each detailed point arising from the Kemeny Commission's Report, as from all other studies of safety matters, is given careful thought.

You will appreciate that we have a policy of continuing research and development in the area of safety after plants go into operation. This research and development is under-pinned by a more basic safety research programme undertaken by the Authority. This general approach seems to be fully justified by the Commission's findings.

Yours sincerely

A handwritten signature in cursive script, appearing to read "A. M. Allen".

(A. M. Allen)

THE KEMENY COMMISSION REPORT

Comments by NNC

Actions Undertaken

1. Since the accident at Three Mile Island at the end of March 1979 NPC has co-operated with other parties in the UK in evaluating and interpreting the information which has become available. Also the Nuclear Division of the Westinghouse Company has been involved in activities related to the TMI accident. These have ranged from the provision of technical support for post-accident operations at the TMI site to responses on safety matters for other US PWR's to NRC requirements, and NPC has been provided with information and expert opinion from Westinghouse.
2. For its own purposes and on behalf of the Generating Boards, NPC safety engineers who are independent of the AGR project teams have carried out a preliminary investigation of the implications of the TMI accident for all UK AGR's. This has been discussed with the Boards to confirm which of the existing provisions and procedures are satisfactory and examine which, if any, could be given worthwhile improvement.
3. A parallel investigation has been made and discussed with CEGB of the implications of the TMI accident for the PWR design which is being proposed by NPC for construction in the UK.
4. The different approach to safety requirements and analysis in the UK results, by comparison with US practice, in the analysis of multiple plant faults, in a lesser reliance on operator action and in greater degrees of redundancy in safety equipment. Thus, in addition to some existing safety advantages which the Westinghouse Nuclear Steam Supply Systems possess when compared with corresponding plant at TMI, further safe-guards are provided in the UK adaptations of the Westinghouse design.
5. From the design and construction points of view NPC studies of the numerous reports issued by the NRC indicate that further investigation is required in the following main areas: a broader base of potential fault sequences than is called for by the current US NRC requirements; the role of operators in fault conditions; improved indication of plant state in the control room during faults; and design features to mitigate core damage and melt-down accidents. These aspects were already being given attention in the UK before the TMI accident. For example, for the new AGR's much discussion has taken place between NPC and the Generating Boards to agree the optimal role of the operators. The current position is that they will not be 'locked-out' completely but that they will be able to intervene in the automatic safety sequencing only in compliance with strict procedures which ensure that there is no prejudice to safety. Since TMI, NPC has increased the emphasis on design investigations to mitigate core damage and melt-down accidents in PWR.

Views on the recommendations of the President's Commission

6. Because much information already available from the US had been the subject of study in the UK, there is little in the report of the President's Commission which is unexpected. Two points from the report are worthy of comment before examining those of the recommendations which relate to the activities of NPC.
7. A quotation from the report puts the accident in context: "We are convinced that if the only problems were equipment problems the Presidential Commission would never have been created. The equipment was sufficiently good that, except for human failures, the major accident at Three Mile Island would have been a minor incident." Moreover, the investigation "centred on one accident at one nuclear power plant in the United States". Thus, insofar as the station design or construction was the source of the accident the conclusions relate to a particular design of PWR and not to all nuclear power stations. Insofar as the accident was attributable to human failure or the failure of institutions the conclusions relate to training, qualification and licensing practice in the USA generally.
8. Because the institutional arrangements in the UK are very different the problem of assessing the relevance of the Commission's comments to the UK is not one of direct translation but rather of an imaginative examination to see whether there are parallel but different criticisms of UK practice which might be made in similar circumstances. NPC believes it is correct to say that most of the institutional criticisms are not directly applicable here, but that the TMI accident and the Commission's conclusions should serve as a more general reminder of the need for regular critical examination of UK arrangements. We draw attention to the very significant difference in the approach to safety between the UK and the US: in the UK it is the role of the Generating Boards and NPC to agree appropriate safety design requirements and provisions and produce a comprehensive safety case which is then subjected to rigorous assessment by the NII. This procedure encourages a systematic approach to safety which, as noted by the President's Commission, is more productive than "a preoccupation with regulations".
9. In considering the recommendations in detail, NPC notes that those under the headings A, E, F and G are primarily the concerns of the NII and Generating Boards; they are therefore not discussed further in this note.

B. The Utility and its Suppliers

From the suppliers point of view the relevant points addressed are:-

"the industry must set and police its own standards of excellence"

"each nuclear power plant company should have a separate safety group that reports to higher level management"

"integration of management responsibility at all levels must be achieved consistently"

"it is critical that knowledge and expertise gained during design and construction of the plant be effectively transferred to those responsible for operating the plant"

"attention and care must be devoted to the writing, reviewing and monitoring of plant procedures"

The Commission notes that "these goals may be achieved at the design stage by (1) contracting for a "turnkey" plant in which the vendor or architect-engineer contracts to supply a fully operational plant and supervises all planning construction and modifications; or (2) assembling expertise capable of integrating the design process."

NPC believes that past practice in the UK has been in accordance with these recommendations. If future practice for AGR station construction involves a division of responsibilities both for design and site construction between the Generating Boards and NPC it will be important to ensure that these divisions are clearly defined and that they are associated with appropriate authority for the Board and NPC management involved.

C. Training of Operating Personnel

This is mainly a concern for the Generating Boards. From the NPC standpoint the main contribution is the writing of clear and concise Operating Instructions, the handing-over of experience to the Operating Staff during Station Commissioning and Raise-Power operations, and the provision to the Generating Boards of operational transient analyses. These are supplemented by lectures from NPC staff to Generating Board operators prior to the raising of power.

D. Technical Assessment

For NPC the relevant main points under this heading are:-

"providing information to operators to help them prevent accidents and to cope with accidents when they occur"

"equipment design and maintenance inadequacies noted at TMI should be reviewed from the point of view of mitigating the consequences of accidents"

"continuing in-depth studies should be initiated on the probabilities and consequences (on-site and off-site) of nuclear power plant accidents, including the consequences of melt-down"

For more than a decade in the UK computerised data processors have been included in nuclear power stations for data reduction and information display. The objective is to give clear and concise information to the operator, particularly in fault situations. The continued improvement of these facilities is part of the on-going design process.

The UK design safety requirements developed within the industry over the past decade and implemented in the design process for current projects include a requirement to carry out probability analyses of a wide range of potential fault sequences. The plant which is installed in UK nuclear stations has to be such that extremely low levels of probability of failure leading to radioactivity releases are achieved. This means that significantly higher degrees of redundancy and diversity of equipment are provided in the UK than in the US where "the single failure criterion" is applied.

NPC has been aware for some years of the need, noted by the Kemeny Commission, for more comprehensive small LOCA analysis and the dangers of over-emphasis of large LOCA analysis. Methods for examining this type of fault exist and NPC is involved in refining them and in applying them to the proposed UK design.

10. Concluding Remarks

While many of the relevant recommendations in the report of the President's Commission are already satisfied by UK practices for nuclear safety, and are being applied by NPC in their current programmes of work on AGR's and PWR's, it is of the utmost importance that complacent attitudes to safety are not allowed to develop. The accident at TMI and report of the Commission have provided a sharp reminder of the necessity to maintain unremitting vigilance in all aspects of design, construction and operation which are involved with the safety of the public and operators. NPC will continue to devote the effort necessary to take full account of any further lessons which may emerge from, for example, the announcement to be made by the US President on the Commission report and the NRC's own major investigation which is still in hand.

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5 December 1979

CENTRAL ELECTRICITY GENERATING BOARD

THE KEMENY REPORT AND THE
CEGB RESPONSE

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CENTRAL ELECTRICITY GENERATING BOARD

THE KEMENY REPORT AND THE CEGB RESPONSE

1: INTRODUCTION

1 At the end of October 1979, the United States President's Commission on the Accident at Three Mile Island published its Report, subtitled "The Need for Change: The Legacy of TMI". The Commission Chairman was Professor John G. Kemeny, President of Dartmouth College, Hanover, New Hampshire and the Commission's report is therefore referred to as "the Kemeny Report".

2 This report, which has been prepared at the request of the Secretary of State for Energy, gives an account of the actions being taken by the CEGB in the light of their study of the TMI Accident, the Kemeny report and their review of safety procedures. It reflects predominantly the Board's interests and responsibilities as a large-scale operator of nuclear generating plant.

2: THE THREE MILE ISLAND ACCIDENT,
MARCH 1979

General

3 On 28 March 1979, the Unit 2 Reactor at the Three Mile Island (TMI) nuclear power plant near Middletown, Pennsylvania U.S.A. suffered a serious accident which resulted in the complete shutdown of the Unit and also had widespread effects on a number of communities in the neighbourhood of the plant: the Kemeny Report describes it as "the worst accident in the history of commercial power generation" (page 1 of the Report).

4 Such an event was bound to be of deep concern to the CEGB and, from the outset when only preliminary reports were available, the Board consistently affirmed the intention to study the TMI accident to see what lessons could be learned and to ensure, in consultation with appropriate authorities, that they were applied to CEGB nuclear power stations, existing and projected.

5 The CEGB noted that, despite the severe damage to the core and equipment within the containment building, the safety provisions ensured that no significant harm was caused to any person at the power station or outside it. The official reports from competent authorities confirmed that the environmental impact of the accident was small. Despite the confusion and problems encountered, effective operational control of the plant

/was restored ...

was restored, and a decontamination and plant recovery programme began which will last for a long period of time. This assessment in no way minimises the seriousness of the situation but helps to illustrate the perspective for CEGB appraisal of TMI.

Studies prior to the Kemeny Report

6 In May 1979, the Generating Board's Director of Health and Safety and four CEGB specialists, together with representatives from other UK organisations, visited the USA to obtain first-hand information.

7 This visit, together with many published reports, provided an increasingly detailed appreciation of the sequence of events and the problems encountered at the TMI plant. Equally important, it was possible to study the off-site problems that arose, associated with the health physics surveys of the radioactivity released from the plant, the difficulties in providing accurate and comprehensive information to the public, the overwhelming of the telecommunications systems in the vicinity of the plant, and the inadequacy of emergency procedures. In the light of information obtained from various sources, the CEGB formed the view that the accident escalated because of a series of weaknesses in design, safety analysis, component performance and operator behaviour.

8 In advance of the Kemeny Commission's comprehensive investigation, it was not possible to reach conclusions on the underlying causes of, and contributory factors to, these weaknesses.

3: DIFFERENCES BETWEEN UK AND USA NUCLEAR PLANT AND REGULATORY SYSTEMS

9 Before commenting on the Kemeny Report itself it is necessary to clarify some major differences between the United Kingdom and the United States in relation to types of plant, basis of utility operation, and the respective regulatory arrangements.

Reactor systems

10 The CEGB is currently operating and constructing gas-cooled reactors, (16 reactors operating in 8 magnox stations, 2 reactors operating in an AGR station, and 6 AGR units under construction at three more stations). Because of the differences between gas-cooled and pressurised water reactor systems, an accident of the Three Mile Island type cannot occur in any CEGB

/existing station. ...

existing station. Nevertheless the CEGB has always stated that there is a remote possibility of an accident occurring at a nuclear station which could cause a release of radioactivity outside the station boundaries. Emergency plans for this contingency have been available and published to local communities since the first CEGB stations commenced operation in 1962. The CEGB is therefore directly and currently concerned with generic questions of safety related to any type of nuclear power station.

11 The CEGB has stated its intention of building a PWR station, provided the necessary safety clearances and consents are obtained, and has commissioned design studies for this purpose. Although not yet committed, the Board is therefore actively exploring the possibility of building a PWR station, provided that the necessary safety clearances and consents are obtained. Although in no way committed, the Board is therefore actively involved in PWR technical assessment and component improvement studies, which are being supplemented by the report of the American Electric Power Research Institute and the NRC "Lessons Learned" Reports (NUREG 0578 and NUREG 0585), and other technical investigations prompted by TMI.

Regulatory authorities and licensing practices

12 In comparing procedures and practices of the two countries it must be remembered that in the USA there are a large number of separate utilities, several major nuclear plant contractors and architect-engineers, and a complex interweaving of formal requirements, based on federal and individual state law. The objective of regulatory authorities everywhere is to ensure that acceptably high standards are achieved in all aspects of safety. It is inescapable that it is more difficult to obtain consistency throughout a large number of organisations, such as exist throughout the United States compared with the situation in the UK where there are two Generating Boards operating nuclear stations (CEGB and SSEB), one licensing authority (NII), and now one major nuclear plant contractor (NPC). Many of the findings and recommendations of the Report deal with regulatory procedures which are specific to the USA: they carry no implication that UK procedures are unsatisfactory. It is not yet known to what extent the recommendations will be accepted in the USA, but many regulatory issues have been raised which will stimulate discussion in the UK and internationally. From this some improvements of a detailed nature may emerge, but it is too early to speculate on this.

4: THE KEMENY REPORT AND CEGB RESPONSE

General

13 Following comprehensive study and investigation of the TMI accident in accordance with their terms of reference from the U.S. President, the Kemeny Commission has provided a full

/and impressive ...

and impressive analysis which will be regarded as the definitive account. The lessons to be learned are established, and are unlikely to be significantly altered in principle by other investigations.

14 The Generating Board has therefore considered what the implications, in principle, are in the context of the CEGB nuclear plant programme, accepting that many detailed differences exist between the situation of the CEGB and that of Metropolitan Edison, operators of the Babcock and Wilcox plant at Three Mile Island.

15 The Commission's outstanding general finding is the observation that the fundamental problems are people-related problems and not equipment problems, and that the "investigation has revealed problems with the 'system' *that manufactures, operates, and regulates nuclear power plants" (page 8). Consequently the theme of the Report is the need for an overhaul of the regulatory system and policy, which will place more importance on the utility for achieving safety. Coupled with this the Commission stresses the need to recognise "that regulations alone cannot assure safety", and that "it is an absorbing concern with safety that will bring about safety - not just the meeting of narrowly prescribed and complex regulations" (page 9).

16 The CEGB concurs with the Commission in those views, which are very much in line with UK practice established over two decades. The CEGB has always been statutorily responsible for safe operation of its nuclear plant, and CEGB policy is to ensure that management and staff at all levels are motivated towards safety and have a good appreciation of the safety characteristics of plant they are operating. This is done within a framework of Operating Rules, Safety Rules and Nuclear Site Licence Conditions. It has always been recognised that there was a significant difference between the US and UK approach to regulatory control. In the UK, the NII and the Generating Boards have always taken the view that it was more satisfactory to require the licensee to produce a comprehensive safety case that would stand up to rigorous assessment than to require him to meet a detailed set of regulations and criteria. It was thought that the latter approach might encourage an inflexible attitude to safety problems.

Issues of priority concern to the CEGB

17 As operators of nuclear power plant, the Generating Board's prime concern since April 1979 has been to examine issues, and where necessary initiate action in the following broad areas high-lighted by TMI:

- (a) Utility safety policy;
- (b) Training of operating personnel;
- (c) Emergency planning and response;

and, so far as the UK is concerned, to a somewhat lesser extent

*Footnote 'system' is interpreted as meaning /((d) ... organisational arrangements.

(d) Nuclear regulatory organisation.

18 Since June of this year, items (a), (b) and (c) have been under review. Current practice and procedures for emergency planning are being systematically compared against the Three Mile Island experience, in consultation with the NII and other UK reactor operating organisations, i.e. SSEB, BNFL, UKAEA. 'The section of the Kemeny Report entitled "Account of the Accident" (pages 81-149) is particularly valuable with regard to these matters and the roles played by leading personnel. Topics (a), (b), (c) and (d) are dealt with more extensively in Sections 5, 6, 7 and 8 of this Report.

5: UTILITY SAFETY POLICY

Organisation

19 In Section B of its Recommendations, entitled "The Utility and its Suppliers" (p. 68), the Commission recommends that the US nuclear industry should "dramatically change" its attitude towards safety.

20 If carried into effect, the detailed recommendations would represent a marked shift towards UK practice, where the utility has to accept full responsibility for the safety of its nuclear plant. This includes assessment of the design and construction of all safety-related equipment, the operation and maintenance of plant, and the control of all activities during fault conditions and emergencies. In its Generation Development and Construction Division, its Research Division, and other specialised Departments the Generating Board has engineering and research expertise and resources which provide support to the operating stations in many important areas such as fuel behaviour, reactor physics, pressure circuit integrity and associated technical fields and, equally important, expert resources can be quickly marshalled to deal with a wide variety of engineering and metallurgical problems. Furthermore the CEGB engineers who have been closely associated with the design phase are able to bring the knowledge gained during that period to assist in remedying plant defects which may arise during the service life of the plant.

21 Under the Nuclear Installations Act 1965, final responsibility for nuclear safety rests with the Board. For the day-to-day operation of each CEGB nuclear power station, authority is delegated through Regional management to the Station Manager, who therefore has immediate responsibility for the safe operation of a nuclear plant. In carrying out those duties, the Station Manager is obliged to ensure that operating procedures comply with Operating Rules, Radiological Safety Rules, Electrical and Mechanical Safety Rules, and with the conditions laid down in the formal Nuclear Site Licence issued by the Health and Safety

/Executive. ...

Executive. These are devised and prescribed by various authoritative bodies external to the station, and cannot be altered without reference back to them. For example, the Operating Rules designate reactor operating parameters that must be maintained and equipment that must be available in order to ensure that if faults occur, then the reactor is automatically shut down or reduced in power so that it continues to be in a safe state. The Radiological Safety Rules and the Electrical and Mechanical Safety Rules specify procedures for providing protection to operating staff, and precautions that have to be taken when working in radiation or contamination areas, or when working on electrical equipment. The Nuclear Site Licence conditions cover a wide variety of activities including maintenance and inspection procedures, plant modification procedures, reporting of incidents, storage and disposal of new and irradiated fuel, storage of radioactive waste, emergency arrangements and reporting of incidents.

22 CEGB experience has shown that to obtain the best results in a project, a good working relationship has to be established between the designer and the operator, who contributes a feedback from past operating and safety experience. The Commission recognises this need and also emphasises the need for a close relationship between the operator and the suppliers.

23 The Commission recommends that each nuclear power plant company should have a separate safety group that reports to high-level management. This has been established practice within the CEGB for the past 20 years, where there is a separate Health and Safety Department whose Director reports directly to the Chairman and Board Members. This Department has about 65 fully qualified engineers, scientists, health physicists and medical staff who carry out assessments and provide advice on all aspects of plant design and operation. Health and Safety Department Inspectors are permanently based at the nuclear stations where they carry out an audit function, and report back safety-related problems or situations which they consider might develop into potential hazards. The Director of Health and Safety is thus able to arrange for appropriate action to be taken with line management to ensure that safety standards are maintained.

24 Each station has a Safety Committee and these Committees meet monthly. The membership was deliberately established, and is maintained, at a senior level, including the Station Manager, the CEGB's Directors of Operations, Health and Safety, Engineering and Research, together with senior experienced members of the UKAEA and British Nuclear Fuels Limited (BNFL). Each Committee reviews fault studies and analyses which take into account new data or experience; in particular, no changes in Operating Rules or significant modifications to safety-related equipment can be made without a written report being approved by the Committee and subsequently the Nuclear Installations Inspectorate (NII). The

Station Managers meet quarterly to review and appraise operating performances and experience, and there is also a quarterly Operations Conference attended by senior members of all UK reactor plant operating organisations which again consider performance and safety-related topics. These arrangements ensure a sharing of experience and discussion of problems, while the Safety Committee procedures impose a discipline and motivation towards an awareness of safety which is so important.

25 Having re-appraised these arrangements, the Generating Board remains convinced that their basis of organisation is sound and well able to discharge its tasks.

Technical Assessment

26 With regard to PWR technical aspects, the CEGB and NPC already have under consideration the recommendations for improvement of equipment. The Report is not at its strongest on these aspects, and it is likely that more comprehensive analysis and recommendations for improvement of equipment will be forthcoming from investigations being carried out by other organisations in the USA. Modifications proposed and fully accepted by appropriate US organisations will be considered for incorporation in the design of the PWR being developed for the CEGB, as will any improvements which may be developed in other countries with PWR plant. The CEGB is also studying with NPC any possible applications which are relevant to gas-cooled reactor plant.

6: TRAINING OF OPERATING PERSONNEL

27 Undoubtedly operator response during the TMI accident was inadequate and the Commission makes a number of recommendations for improving the calibre and training of operators, which again move closer to UK methods. It is not UK practice to licence operators formally but they are appointed by the CEGB with the requirement that the NII is satisfied that acceptable standards of competence are being achieved.

28 In order to put the Kemeny findings into perspective, it is necessary to explain the rather different arrangements in the UK, compared with those described in the Report.

29 The CEGB's policy is to employ graduate, chartered or qualified engineers as Shift Charge Engineers. An operating engineer, after initial training, will usually be appointed as an Assistant Engineer and work as a control room desk operator. After an appropriate interval he may then move to refuelling operations or auxiliary plant and gain experience of equipment operation. The next appointment will be to Assistant Charge Engineer, for a period of one or more years which may include transfer to another station enabling him to obtain a wider variety of experience before promotion to Shift Charge Engineer. Thus

/the latter ...

the latter will have had several years' experience with considerable on-the-job training. He will attend courses at the Nuclear Training Centre at Oldbury to augment his theoretical knowledge of reactor plant design, safety principles and fault conditions, and where he takes part in reactor simulator exercises. Experience has shown that the standard of operation is good and, where reactor incidents or problems have occurred, operator response has been satisfactory. Nevertheless, in the light of TMI a review of operational training is being carried out with emphasis on the scope and frequency of refresher courses, and the full use of the facilities of the Training Centre, which are currently being extended by the commissioning of simulators for each AGR station. The provision of information to control room engineers during fault conditions is also being reviewed and their likely responses reassessed. Particular attention will continue to be paid to control room layout and instrument display during fault conditions for new plant, which already incorporates data processing equipment.

30 In matters of recruitment and training policy, there is within CEGB a continuous process of review and improvement in the light of experience. Detailed action as a result of TMI fits into this pattern.

7: EMERGENCY PLANNING AND RESPONSE

31 The lack of preparedness for an emergency is well documented in the Report, and stems from the fact that the NRC had no statutory authority to require the individual States to prepare emergency plans. In the UK each nuclear station has always had an emergency plan which includes offsite activities which has to be approved by the NII, and exercised annually to the approval of the NII. The Report's recommendations follow very closely the principles of the UK established procedures.

32 Emergency Plans for dealing with serious accident conditions and offsite radioactivity releases have been in existence and publicised to local communities since the CEGB's first nuclear stations started operating in 1962. Throughout the year exercises are held in firefighting, first aid and rescue, health physics surveys and damage control. These exercises culminate in a large scale exercise every year that simulates an accident giving rise to an offsite radioactive release, and involves the co-operation of the police and local emergency services. These annual exercises have to be carried out to the satisfaction of the CEGB's Health and Safety Department and the NII. The Plans include arrangements for co-operation with police, emergency services, local authorities, land and water authorities. Iodate tablets can be readily issued to the local population if necessary, and the police are at short notice able to undertake evacuation of people up to about one mile from a station, or further beyond this if necessary. An Emergency Controller is nominated to operate from an Emergency Control

Centre fully equipped with communication and other facilities and located some distance from the reactor control room. He has to control the emergency activities including on-site and off-site monitoring of radioactivity, and provide information and advice to the police, local and national organisations. A feature of the TMI accident was the unpreparedness and divided responsibilities of state and federal organisations, which contributed to increased concern and large scale evacuation by the local people. The CEGB's plans are therefore being reviewed against the TMI experience. One evident factor is the short time in which telephone systems can be overwhelmed and the need for supporting communications systems. These need to provide not only for operational purposes but also for the provision of adequate information for the media and to local and public authorities.

The Public's right to information

33 The Commission devotes a section of recommendations to the subject of providing information to the public during an emergency. The major lesson learned by the CEGB visiting team was the large number and rapid build-up of news media people who will arrive at the site of an accident, something like 300 at TMI.

34 The CEGB Emergency Plans include the provision of Information Centres about a mile from each nuclear power station. In the light of the TMI experience these would be quite inadequate in respect of size and communication facilities. During the past months the CEGB has been reviewing this situation, and plans are being formulated for the provision of larger facilities at the earliest practicable time.

35 From the start of the nuclear power programme, each station has had a Local Liaison Committee. This includes elected members and officials of the county and local authorities; representatives of local organisations including the police, water authorities, and farming interests; and representatives of the CEGB and the authorising Ministries.

36 At the meetings of these Committees, CEGB representatives provide information and reassurance on the way in which radioactive materials are used at the station. They also explain the significance of radiological measurements which are made outside the station boundaries. The Emergency Plans for the protection of the public in the event of an accident are also discussed.

8: NUCLEAR REGULATORY ORGANISATION

37 In Section A of the Recommendations, entitled "The Nuclear Regulatory Commission" (pages 61-67), the Kemeny Commission recommends the restructuring of the NRC into a new independent agency, and then continues to outline the responsibilities and duties of the new agency. For reasons already indicated, there is nothing directly relevant to UK statutory procedures, and it

is the Generating Board's view that the present statutory requirements are satisfactory. The TMI accident showed that there had been inadequate safety analysis applied to the accidents less severe than the worst credible accidents, and also to equipment not designated as safety-related items. This section of the Kemeny Report highlights the need to include the full range of possible fault sequences in safety analysis, and not just those specified in detailed criteria and regulations. As already noted it has been well established UK practice to give comprehensive treatment to fault conditions in safety reports prepared by the designer and the operator, which are then rigorously examined by the NII.

38 Some mention is also made of siting where the policy is different from that of the UK. The Commission's views are not at all clear, but again very full consideration has always been given in the UK to siting requirements, taking into account the remote risk of an accident.

9: CONCLUSIONS

39 The CEGB visiting team in May formed the view that the TMI accident had not revealed any fundamental weakness in the PWR concept or its basic engineering. The accident developed because of weaknesses in detail design, safety analysis, performance of some components, and above all operator behaviour. The Kemeny Report has confirmed this view, and the majority of the Commission's findings and recommendations are concerned with the organisational arrangements and procedures for achieving safety, rather than specific recommendations concerning equipment.

40 The TMI accident and the subsequent investigations do not alter the CEGB's opinion that pressurised water reactors can be built and operated in the UK to the high safety standards that are required.

41 The Commission was not asked to comment on the broader questions of nuclear energy, but nevertheless stated that their "findings do not, standing alone, require the conclusion that nuclear power is inherently too dangerous to permit it to continue and expand as a form of power generation" (page 7). After detailed examination by the group of independent people forming the Commission this is an important conclusion for all concerned with decision-taking in the nuclear industry.

42 The Kemeny Report criticised the utility for inadequate attention and resource given to many safety matters, and emphasised the need for utilities to give more importance to many aspects of safety. It is considered by the CEGB that many US utilities seem to have been sandwiched between the strong competence and resource of the main suppliers on one hand and a powerful NRC on the other. It appears that during the design and construction phase some utilities rely in large measure on these organisations for production, assessment and resolution of safety reports and problems. Consequently during the operational phase these

utilities may find themselves without adequate knowledge and resource when difficult problems occur, of which the TMI accident is an extreme example.

43 The importance of safety has always been fully recognised by the CEGB, and it has played a leading role in the specification and assessment of safety-related equipment during the design and construction phases of nuclear plant projects. The operational procedures described earlier in this report indicate the effort and attention that is given to safety during operational life. An important feature is the support provided by the engineering and research divisions of the CEGB.

44 The Kemeny Report does not allocate blame for the accident to individuals, although considerable attention is given to operator behaviour and response. It has to be remembered that the utility staff and management remained in control of the plant throughout the accident, and were responsible for the eventual recovery and stabilisation of the situation. The CEGB believes that the unfortunate sequences of events during the early stages of the accident were due to inadequate operator qualifications, experience and training. The control room staff did not possess the full expertise needed to master the complex situation that quickly developed, and they were not sufficiently assisted by the operating procedures and instructions provided by the infrastructure of the utility, the supplier and the regulatory body. The operators were also confused by poor instrumentation information. The Report fully recognises these fundamental weaknesses and puts major emphasis on the need to improve operator quality and training.

45 The CEGB does not believe that the Report has signposted deficiencies in its own practices, but nevertheless it is carrying out a review of its training procedures. This is looking in particular at the role of simulator training, and the provision of information in the control room during fault conditions.

46 Since the team visit in May the CEGB has considered the technical aspects of the TMI accident, and any application to its gas-cooled reactor plant and the proposed PWR station. It is doing this in co-operation with NPC. Several of the technical factors which contributed to the TMI accident were special to the TMI type of plant, and care would be taken to ensure that they would not feature in any PWR plant design proposed by the CEGB. Compared with current US PWR designs, the CEGB design will include modifications required by UK safety standards already identified, and any necessary changes resulting from detailed analysis of the TMI accident determined by UK reviews, USA reviews, or reviews instituted by other countries with PWR plant.

47 A major difficulty which arose at TMI was the handling of off-site problems including assessment of radiation exposures, the provision of public information, the swamping of telecommunications, and arrangements for evacuation of the public. The difficulty was compounded by lack of co-ordination and preparedness by the various state authorities. The CEGB has well-established emergency plans at each nuclear station for accidents giving rise to radioactive releases. Many of the Kemeny Report recommendations closely follow these arrangements. Nevertheless the information obtained from the visit in May caused the CEGB to review its plans in the light of the TMI experience. Some parts of the plans will be amplified, and in particular improved facilities are being planned for briefing of the news media during emergencies. The CEGB National Grid Control telecommunication system provides essential but limited lines of communication independent of the public system, but at some stations the latter will be strengthened in order to remove the possibility of restriction of technical discussion of flow of information. A review is also being made of liaison procedures between senior management and officials of all the UK organisations concerned, for an incident which might last several days.

48 The repercussions of the TMI accident have been wide, and interest and discussion have been stimulated within many parts of the CEGB organisation. Few staff have so far had the opportunity to study the Kemeny Report in depth, but it will be widely distributed to those concerned with nuclear plant. There are lessons to be learned by the organisation, and by individuals in carrying out their duties: from this process, further opinions will no doubt emerge on the details of many of the CEGB's practices and procedures, and they will be taken into account wherever appropriate.

ABBREVIATIONS

AGR	Advanced Gas-cooled Reactor
B & W	Babcock & Wilcox (The company that designed and supplied the TMI-2 reactor and nuclear steam supply system)
BNFL	British Nuclear Fuels Ltd.
CEGB	Central Electricity Generating Board
EPRI	Electric Power Research Institute (US)
NII	Nuclear Installations Inspectorate (UK)
NPC	Nuclear Power Company (UK)
NRC	Nuclear Regulatory Commission (U.S. agency responsible for the licensing and regulation of commercial, test, and research nuclear reactors)
PWR	Pressurised Water Reactor
SSEB	South of Scotland Electricity Board
TMI	Three Mile Island (Site of two nuclear power reactors operated by Metropolitan Edison Company)
UKAEA	United Kingdom Atomic Energy Authority