DECISION CASE STUDY
UNITED KINGDOM
MOSSMORRAN-BRAEFOOT BAY

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CHAPTER 1: INTRODUCTION

1.1. PERSPECTIVE

Economic, environmental and safety considerations inevitably arise in siting decisions for any large scale energy, chemical handling or production facility. This report represents a review of selected aspects of the decision and approval process involved in the siting of liquefied energy gas facilities at Mossmorran and Braefoot Bay in Fife, Scotland. Consideration is given to the potential hazard (health and safety), environmental and economic impacts of these facilities, as perceived by the different parties involved in the decision process, against a background of the statutory decision procedures that were followed in obtaining official approval of the developments. Public participation will be of particular interest. Since this was stimulated largely by the potential health and safety impacts, these will be given particular emphasis, not so much as issues in their own right but more in terms of the legitimacy of the mechanisms through which they were addressed at various stages in the decision process.

The period under consideration in this report covers the three years between July 1976, when initial interest in a site at Mossmorran-Braefoot Bay was expressed, until August 1979, when approval of applications for gas facilities on this site was officially announced. The facilities are required in connection with oil and gas production from the UK sector of the North Sea, and the site chosen, on a relatively unspoiled stretch of the Forth Estuary, meant that the decision itself would impose a judgment over a number of classic conflicts: health and safety costs and

economic benefits; local losses against national and regional benefits; differences in party self-interests between and within sections of the public, public authorities and private industries. An indication of the main course of events during the decision period will set the bearings for the story which unfolds in the remainder of the report.

The starting point is taken as July 1976 because although formal planning applications were not lodged until January-March of the following year, there was a phase of considerable informal consultation during the latter half of 1976. The lodging of formal planning applications early in 1977 activated the main official decision machinery: publicity by the host local authorities, notification to higher tiers of government, and expert consultation on potential impacts. A public inquiry (June-July 1977) was to become the centerpiece of the decision process--the main vehicle of public participation, and forum for arguments for and against the planning applications to be openly articulated. An official decision based on the Inquiry proceedings and any other relevant considerations had been anticipated from the Secretary of State towards the end of 1977, but was not to be announced for another eighteen months. The unusual and quite unexpected delay was due to a source of hitherto overlooked potential hazard--electro-magnetic break sparks from radio transmissions--whose lengthy consideration raises issues of rather greater procedural significance than the substance of the sparks issue itself.

The decision of approval announced in August 1979 was underpinned by support from both local and national government, which had been evident from the earliest stages, but bitter resentment from an extremely articulate and well organized local public interest group, fearful of the safety of their homes and livelihoods in the face of the hazard potential of the proposed installations and their associated activities. Their campaign opened the decision process to wider examination, and external observation of it is instructive because it coincided with a major shift in official handling of planning applications for hazardous installations in the UK. Because of its position as something of a landmark in this field, some of the grievances and fears expressed by sections of the public are unlikely to find repetition in subsequent decisions. The campaign as a whole is nevertheless worth detailed review as an essential component of a learning process in the handling of decisions on hazardous activity.

The case study illustrates problems which are fascinating for their complexity and defiance of satisfactory solution. Unequal distribution of costs and benefits and illusive notions of Pareto optimality; the rights of industry to operate without undue interference from others, and of the public to exist without fear of undue imposition by industry; the trade-off between decision taking and decision postponement in the face of a never stationary frontier of knowledge and experience in an area of high potential risk; the very different perceptions of risk acceptability by various individuals and organizations; the extent to which acceptable risk can and should be seen to be achieved through publicly acknowledged safety scrutiny during a decision process; the standing of minority interests, in particular problems of "accountability" which arise when a population considering itself at most risk is too small in number for normal democratic representation; and the single issue nature of their concern arguably unsuited to representation by existing democratic means.

1.2. STATUS OF REPORT

This report* has been prepared in connection with a research project at IIASA designed to analyze and to compare the decision procedures followed in different countries for the siting of liquefied energy gas installations. Four liquefied energy gas facilities worldwide were identified for detailed case study, including Mossmorran-Braefoot Bay in the UK; other sites are in the USA, the Netherlands, and the Federal Republic of Germany (FRG). There are a number of features that distinguish the Mossmorran-Braefoot Bay developments from these others, including the following:

(1) The substances to be handled at the Mossmorran installations are LPG's and not LNG; individual hazard properties are different and may lead to a different evaluation of hazard consequence.

(2) The installations will represent export rather than import facilities for their host country.

(3) The LPG facilities involved were considered within the decision and approval process as part of a larger package of petrochemical developments, involving an ethylene cracker and possible downstream industries at the same sites. The decision process for the LPG facilities alone cannot be easily separated from the package as a whole; the main objectors to the decision, moreover, emphasized that they regarded ethylene to be the most hazardous of the substances involved.

(4) Site screening was undertaken by Shell and Esso, so that from the perspectives of all other parties, Mossmorran-Braefoot Bay can be considered as a one-site decision process.

(5) The decision and participatory procedures involved are UK-specific.

(6) Processing as well as storage and transshipment facilities are involved.

(7) The installations are currently under construction.

*A summary report of this casestudy has also been prepared (Macgill 1982).

1.3. OUTLINE

The structure of the present report was designed in broad terms to match that of other case-study reports being prepared for the IIASA project; choice of aspects given emphasis below was conditioned accordingly. The scope of each chapter is as follows.

Chapter 2: a description of the context for the decision and the main elements of the process. This includes a summary of the nature of the development, in particular its association with oil and gas production from the Brent field (section 2.1.), a review of the choice of the Mossmorran-Braefoot Bay site (section 2.2.), a description of the main parties to the decision (section 2.3.), and the main events in and dynamics of the decision process (section 2.4.).

Chapters 3 and 4: an analysis of the decision problem itself. Four main issues dominated--the national interest, local socio-economic benefits, health and safety aspects and environmental impacts. These are discussed in turn in Chapter 3. The various parties involved--the oil companies, different tiers of local and national government, statutory advisors, private consultants, public interest groups, and key individuals, had varying perspectives on these issues and varying levels of information and expertise from which to judge them. Conflicts arose which required resolution or judgment in the final decision.

Chapters 5 and 6: an analysis of the decision procedure that was followed. In Chapter 5 the normal statutory procedures for processing planning applications are described, and the evolution of the Mossmorran-Braefoot Bay decision process in relation to them is reviewed. This highlights the opportunities available for public participation, the scope for the use of formal and informal analyses for various issues, and the hierarchical interrelationship between parties. It leads ultimately to the final decision, and its official justification. Party perspectives on procedural aspects (considered in Chapter 6) are important as these shed light on the legitimacy of a decision procedure in which important issues of safety, and national and local economics were raised.

Chapter 7: in this final chapter, a preliminary evaluation of selected aspects of the decision process as a whole is offered. Specific attention is given to the treatment of the health and safety dimension, and to public participation.

CHAPTER 2:
THE DECISION STRUCTURE

2.1. CONTEXT FOR THE DEVELOPMENTS

The terms of reference of the decision process to be considered were for the international oil companies Shell and Esso to obtain outline planning permission (i.e., official approval in principle) for the following applications:

(a) an application dated 19 January 1977 by Shell UK Exploration and Production Ltd for the construction of a natural gas liquids separation plant at Mossmorran and associated jetty at Braefoot Bay, together with facilities for the storage, transmission, loading and shipment of separated products;

(b) an application dated 23 February 1977 by Esso Chemical Limited for the construction of an ethylene cracker at Mossmorran and associated jetty at Braefoot Bay, together with facilities for the transmission, storage, loading and shipment of ethylene product; and

(c) an application dated 21 March 1977 by Esso Chemical Limited for industrial development on an area extending to approximately 175 hectares at Mossmorran.

It was also necessary to establish suitable planning conditions in the event of approval being granted.

The facilities would represent the first major new downstream processing plant to be associated with North Sea exploration; hitherto onshore activity has concentrated on platform construction, servicing, oil refining and gas treatment. The facilities are to be built in connection with the exploitation of the Brent oil and gas field in the UK sector of the

North Sea. Brent is the biggest oil field in the UK sector, and has an abnormally high gas content (estimated recoverable reserves 1685 x 10^6 barrels crude oil, 530 x 10^6 natural gas liquids 3.5 trillion cubic feet methane, Shell 1980). The field is managed by Shell, and Shell and Esso each have a 50:50 share in all recoverable output. Commercial oil production began in 1976; gas in commercial quantities was expected to be available in 1980.

The crude oil from Brent is piped to Sullom Voe (Shetland), the gas (methane and natural gas liquids) is to be piped to St. Fergus where the methane will be separated and sold under statutory obligation to the British Gas Corporation. (The Brent-St. Fergus pipeline was completed in 1980, the St. Fergus terminal is expected to be completed late 1981.) The natural gas liquids (NGL's) are the intended feedstocks for the Mossmorran-Braefoot Bay facilities.

As indicated from the fact that three applications were involved, the Mossmorran-Braefoot Bay facilities comprise three separate developments. The NGL plant (application (a)) is required in order to separate the NGL's into commercial fuels and feedstocks ethane, propane, butane and natural gasoline. The ethylene cracker (application (b)) is intended to manufacture ethylene from ethane, ethylene being one of the basic building blocks of the petro-chemical industry. Application (c) relates to downstream industrial development that may be attracted to Mossmorran, given the location there of the ethylene plant. Strictly speaking, the NGL plant is the only one of the three that can be labeled an LEG facility. Figures 2.1 and 2.2 indicate the location, capacities and interrelationships of the plants.

It is appropriate to rank the three applications relevant to Mossmorran-Braefoot Bay according to the likelihood that each would actually be built. A facility for which planning permission is obtained will not necessarily be built in practice and indeed varying degrees of uncertainty about actually building the installations outlined in each of the three applications was openly acknowledged during the decision process.

It was generally appreciated from the start that Shell (who lodged application (a)) were committed to building the NGL plant. However, Esso (who lodged application (b)) were not to make a definite commitment to the ethylene cracker until October 1980. Thus, throughout the decision process (July 1976-August 1979) the ethylene cracker had to be considered as a possible rather than definite development, and as noted below, different parties made very different evaluations of this position. Application (c) was less certain still, not only because of uncertainty surrounding application (b), but also because actual development would be left to other industrial concerns. Clearly application (c) depends on (b), and (b) in turn on (a). However, (a) is not dependent on (b) or (c), and indeed, Shell stated that they would proceed with the NGL plant (application (a)) even if there was not to be an ethane cracker.

This hierarchy of uncertainty is important because it severely complicated party appraisal of the developments as a whole. This is because downstream industries are considerably more labor intensive than basic NGL and ethylene plants (see Table 2.1), and therefore, potentially boost the employment benefits of the whole package. However, the absence of

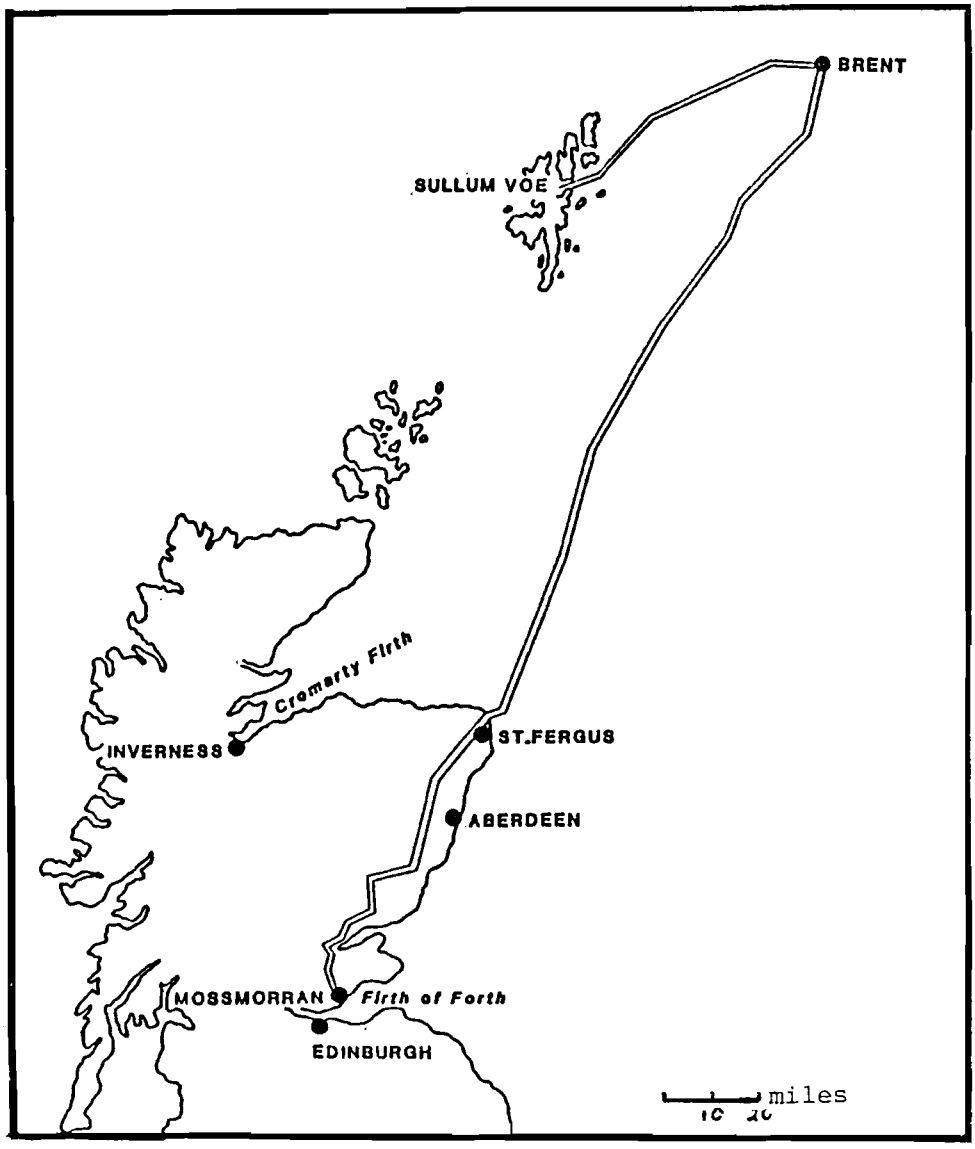

Figure 2.1. Location of Mossmorran.

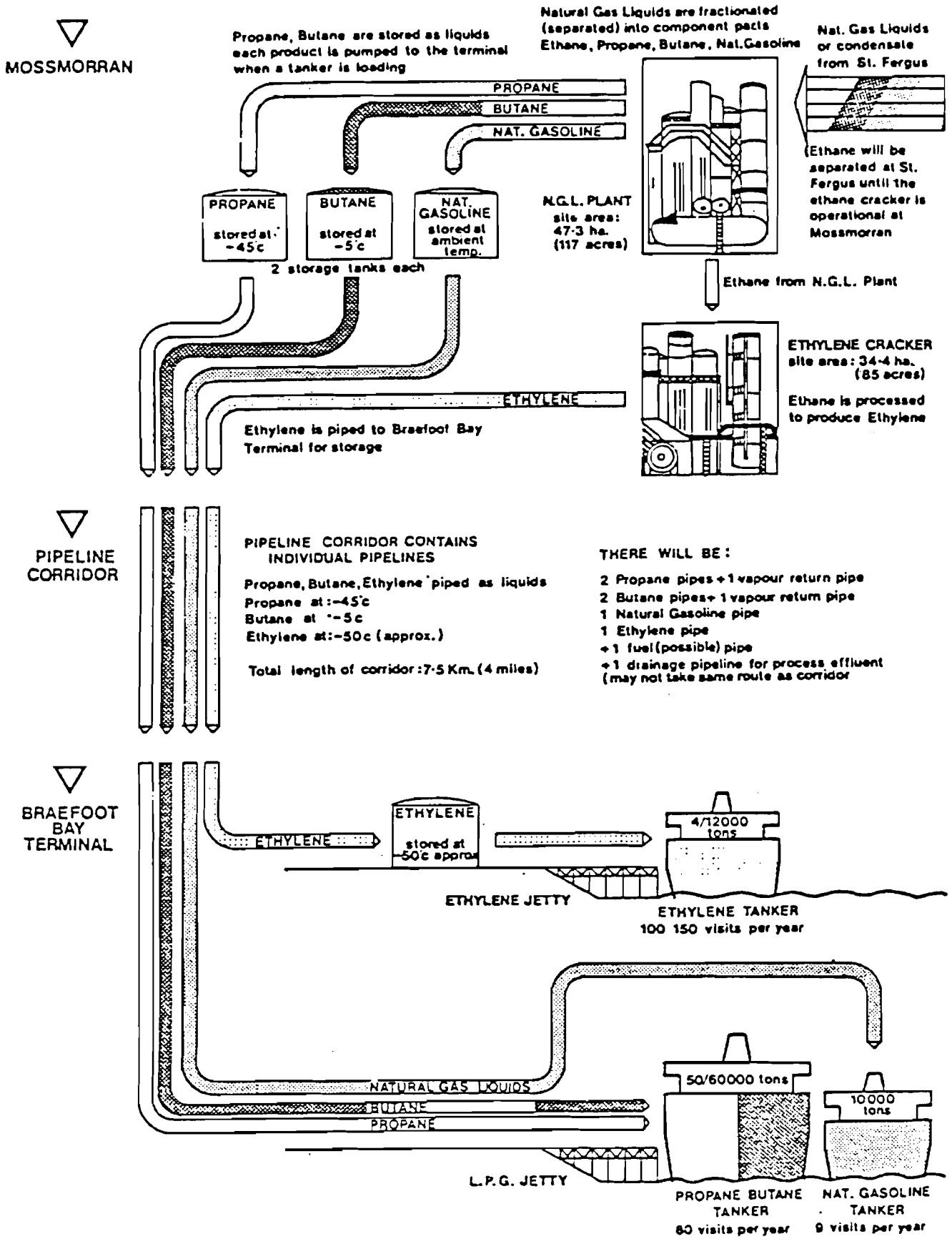

Figure 2.2. How the plants and terminal would relate

(Source: Fife, Kirkcaldy and Dunfermline District Councils 1977)

Table 2.1. Indicative employment implication of the three main types of petro-chemical plants (Fife 1977)

Status of Plant	Example of Plant	Products	Employment Density (persons/hectare)
Primary or Basic	Ngl plant Ethylene Cracker	1 pg. Ethylene	3.12 7.5
Secondary or Intermediate	Polyethylene	Low or high density polyethylene	20.00
Consumer or finished goods	--	Paint, plastics man-made fibres	50.00

firm commitment to such downstream industry severely frustrated assessment of overall economic benefit.

The life of the Mossmorran plant was expected to be about 20 years. Not all the raw feedstock required would necessarily come from currently discovered Brent reserves; future discoveries and further NGL's from future North Sea gathering pipeline developments might also prove important.

Alternative (sub optimal) outlets for the NGL's from Brent, in the absence of facilities such as those planned for Mossmorran, are use as a power-station fuel or possible use at the Grangemouth Petrochemical complex. Flaring would be the least attractive option. In the short term, until the St. Fergus terminal is commissioned, Brent gas will be reinjected.

Most of Shell's share (50%) of the propane and butane output of the NGL plant was intended for North American markets. The destination of Esso's share of the propane and butane was less definite, but was expected to be in European markets or absorbed at Fawley. In the absence of the ethylene cracker at Mossmorran, ethane could be used (sub-optimally) elsewhere in the UK petro-chemical industry or as an industrial fuel. The ethylene produced by the Mossmorran cracker is all intended for export, unless or until application (c) for further downstream manufacture is taken up.

A final development which deserves mention alongside the three applications summarized above is the application for the raw NGL feedstock pipeline required to link St. Fergus with Mossmorran. This is the subject of a separate planning decision, which has not yet been taken--a different set of planning regulations (The Pipelines Act administered through the Department of Energy) is involved for long distance pipelines. It may seem unnatural that what is essentially a single package (installations with their associated feedstock pipeline) is separated in this way. Although the pipeline may be considerably quicker to build, it might be argued that the decision for the installations effectively pre-empts the decision for the pipeline. On the other hand, it could be argued that lack of approval of (successful objection to) the pipeline would provide grounds for abandonment of the installations.

2.2. SITE CHOICE

As already remarked, the Mossmorran-Braefoot Bay case study will be treated essentially as a one-site decision process. The overriding question defining the overall terms of reference of the decision process was "Is Mossmorran-Braefoot Bay, in principle, a suitable site for the facilities proposed?" A related question, by way of qualifying any positive response to this question is, "What planning conditions need to be stipulated in relation to the use of this site for the LEG facilities proposed?" In the case of a negative response to the first question, an alternative site would be sought and a corresponding, but essentially separate decision process would be set in train. In contrast to statutory procedures in other countries, alternative sites would thus be considered sequentially rather than simultaneously, and it is for this reason that the label "one-site decision process" is considered appropriate.

Official decision procedures in Scotland (as in the rest of the UK) are set in train when a planning application for the development of an activity on a particular site is lodged. For a development of the scale of Mossmorran-Braefoot Bay there are likely to be a number of informal consultations with local, regional, and national authorities in advance of the lodging of the official planning application, but the initiative lies overwhelmingly with the developer to choose the preferred site. Official decision procedures are thus geared to a single site, under the Town and Country Planning (Scotland) Act 1972. The Shell-Esso developments were handled as a normal planning application.

As a matter of fact Mossmorran-Braefoot Bay was not the first site chosen for the facilities proposed. An earlier decision process in respect of the NGL plant application for a site at Peterhead had reached the public inquiry stage before being abandoned due to unsuitable harbor conditions (see Appendix 1). Mossmorran-Braefoot Bay was identified as a potentially suitable site, and hence became the subject of a planning application, only after the abandonment of Peterhead.

The absence of simultaneous consideration of alternative sites within statutory decision processes in the UK means that site choice is essentially a boundary condition rather than an open issue to be debated. This is not to say that individual parties to the decision had not been involved in their own private appraisals of alternative sites, and engaged in informal consultations with relevant statutory authorities, in order to establish their own preferred choice, and possibly to identify contingency alternatives. Nor is it to deny the existence of general guidelines and zoning restrictions for the siting of large-scale oil related developments (Scottish Development Department 1974, and Figure 2.3). The Mossmorran-Braefoot Bay site was the oil companies preferred (only?) site and moreover, is among those identified by the Scottish Development Department and relevant local authorities, as potentially suitable for large-scale industrial development (See for example, Scottish Development Department 1977).

The position of site choice as a boundary condition rather than an open question is an issue that will be given fuller consideration below. It met the interests of some parties but others were dissatisfied that many important dimensions could not be adequately appraised against a single site alone, but only in a comparison of several alternatives.

According to the main supporters of the developments, a number of features combined to make the Mossmorran-Braefoot Bay site suitable (in some opinions eminently so) for the developments proposed.

(1) At Mossmorran a 700 acre greenfield site, large enough to accommodate the NGL plant (125 acres), the ethylene cracker (85 acres) and possible downstream industries. This represents a large industrial site by any standards in the UK, and one that had for sometime been proposed for industrial development by the local authorities.

(2) A sizeable construction labor force locally available thus avoiding the need for temporary worker accommodation; although not all such labor would be recruited immediately locally (i.e., from Fife) all would be within daily traveling distance.

(3) A site with good communications to markets for possible downstream products (i.e., rest of UK and Europe);

(4) Labor readily available for such industries.

(5) A site at close proximity (4 miles) to an eminently suitable berthing location at Braefoot Bay for the export of liquid cargo.

The advantages of Braefoot Bay included water of adequate natural depth for jetty facilities, protected by Inchcolm Island against wind and waves and situated away from the main Forth Estuary shipping channel; the only large vessels to be allowed in Mortimers Deep would be those for the terminal (see map in Figure 2.4). The natural contours of the shoreline would visually screen much of these facilities from Aberdour and Dalgety Bay.

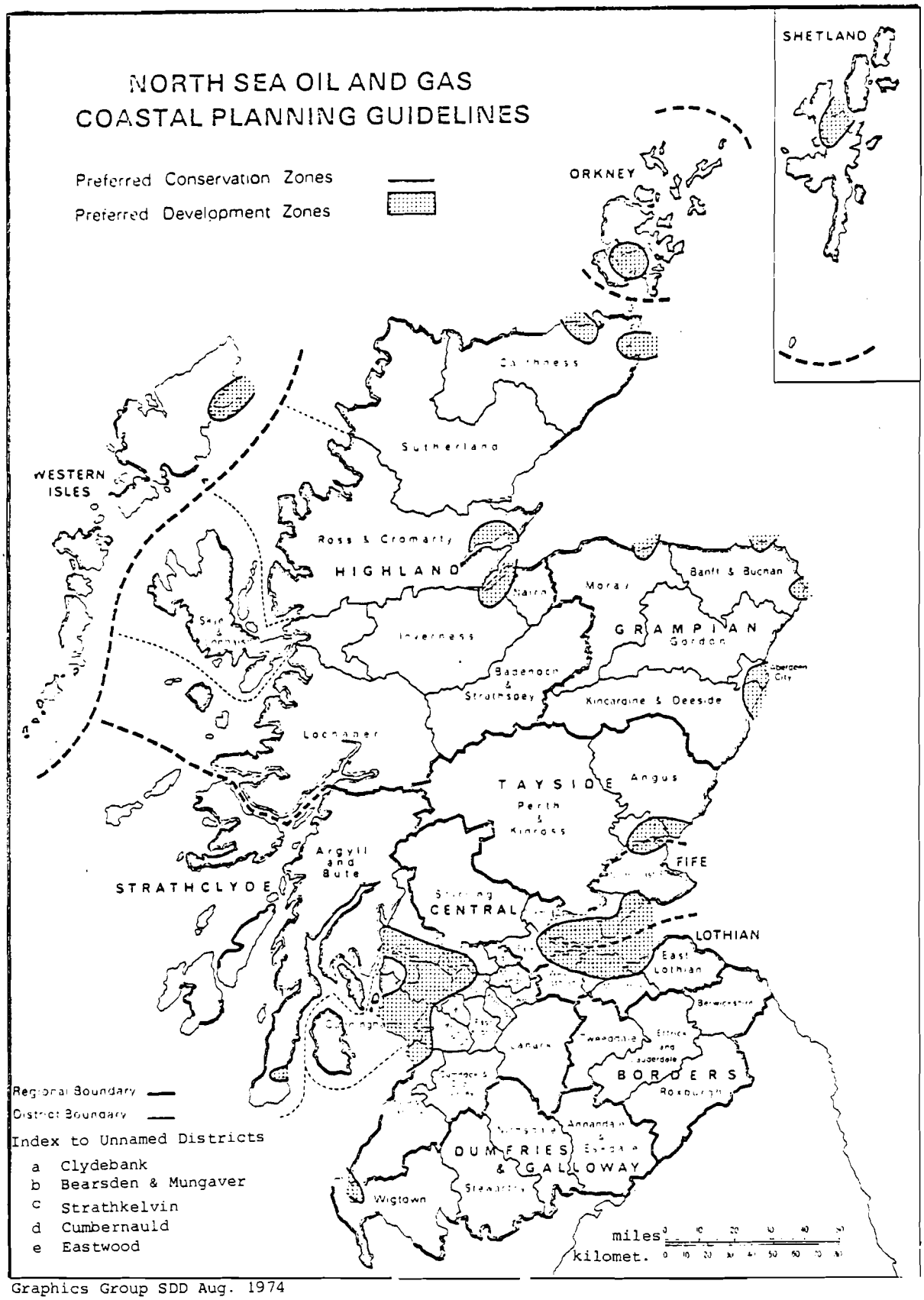

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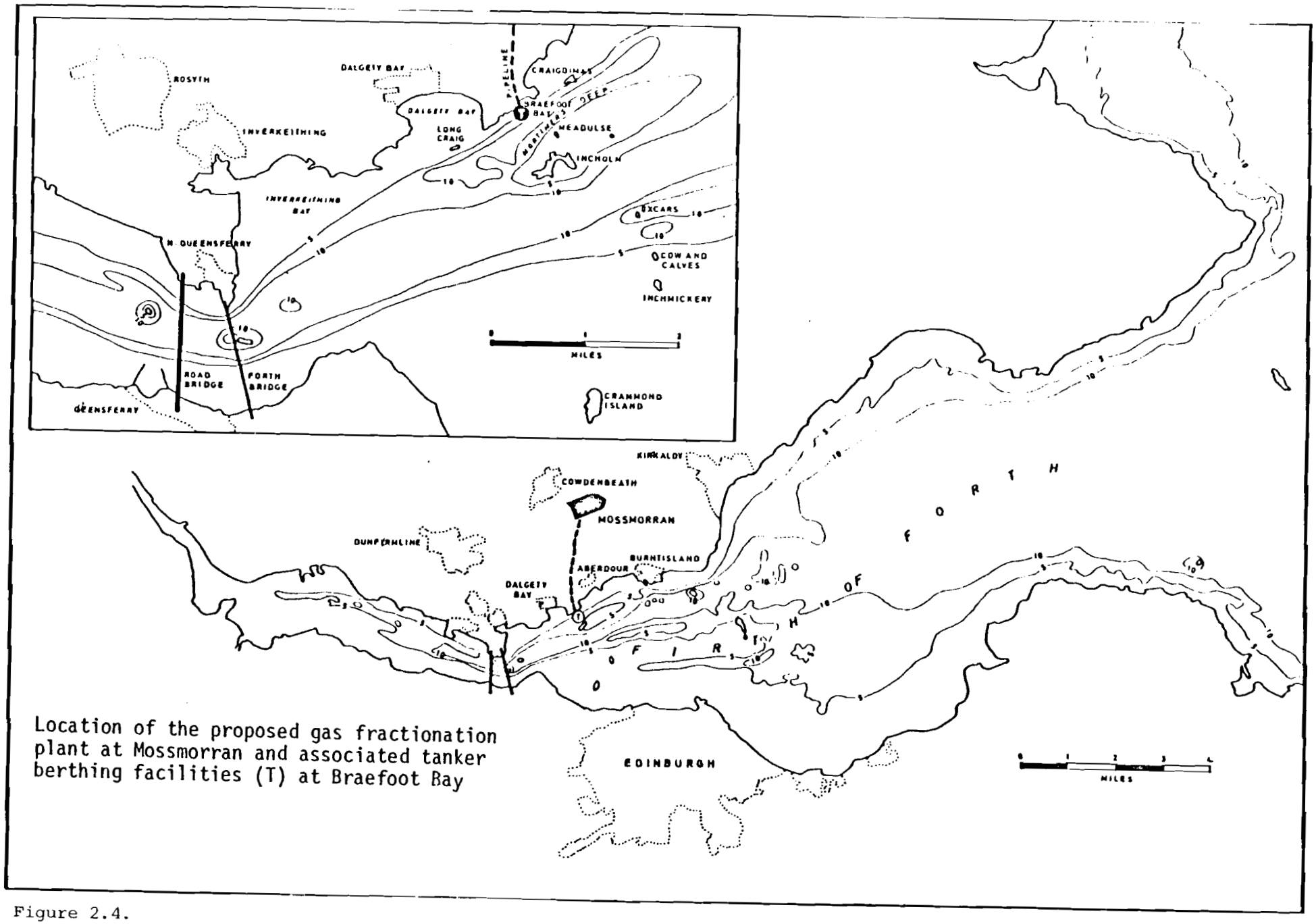
Figure 2.4.



Location of the proposed gas fractionation plant at Mossmorran and associated tanker berthing facilities (T) at Braefoot Bay

Figure 2.4.

Against these advantages, objectors pointed to the close proximity of Braefoot Bay to residential areas (see Figure 2.4). Their primary concern was for the safety of their own communities--Aberdour and Dalgety Bay--but they also pointed out the proximity of the marine operations to other populations on both sides of the Forth, including Edinburgh. They were concerned too about the destruction of ecological habitats, a not insignificant tourist location (mostly day trippers to Aberdour), and local heritage and intrusion of industry on a relatively unspoiled stretch on the North shoreline of the Forth. Interference with yachting was seen as a further problem. Moreover, the objectors were not convinced that feasible alternative sites did not exist.

The Mossmorran site presented fewer disadvantages. Although the land is currently farmed, none is of outstandingly high agricultural quality, and much is low in quality (Department of Agriculture advice). Although a housing estate (Gray Park) is situated to the edge of the Mossmorran site, it was considered to be practicable to re-house the occupants should the need arise (see Appendix 2).

It is important to recognize the socio-economic characteristics of the resident population both near Mossmorran and near Braefoot Bay. Cowdenbeath (near Mossmorran) has a high proportion of un- and semi-skilled labor with a relatively high unemployment rate. Aberdour and Dalgety Bay (near Braefoot Bay) are predominantly middle class communities, suffering little unemployment, and mostly employed in local light industries or commuters to professions in Edinburgh.

It is understood that a number of other locations expressed interest in attracting the developments represented by applications (a), (b), and (c), including areas in Grampian, Clyde, and North-West Scotland. Possible additional sites that were considered by the oil companies are noted in Chapter 5.

2.3. THE MAIN PARTIES TO THE DECISION

The initiating parties of the Mossmorran-Braefoot Bay proposals were Shell UK Expro and Esso Chemical Ltd (referred to throughout this report as Shell and Esso) being the respective applicants for the NGL plant (and associated pipeline facilities to and berthing facilities at Braefoot Bay) and for the ethylene cracker (and associated pipeline facilities to and berthing facilities at Braefoot Bay); Esso was also the applicant for possible downstream petro-chemical developments.

The Shell group, one of the seven oil "majors," is a private international Anglo-Dutch enterprise, with majority shareholding in the Netherlands, but operational and commercial headquarters in London. Shell UK Expro (short for exploration and production) is a subsidiary formed to manage Shell's exploitation of North Sea reserves.

Esso Chemical Ltd is a UK company which is responsible for all the chemical operations of the Esso Group within the UK. It is part of the multi-national Exxon chemical organization (formerly Standard Oil of New Jersey, and another of the seven oil "majors"). Exxon chemical is a pioneer in the development of ethylene plants and in 1977 was producing ethylene at nine locations throughout the world with a total of 200

cumulative years of operating experience.

A final decision on the proposals by Shell and Esso for Mossmorran-Braefoot Bay involved a balance between local and national costs and benefits, and the divergent views on various dimensions that were to be expressed by various parties involved (see Figure 2.5). The parties will be introduced here roughly according to their hierarchy in the decision process.

The individual with overall responsibility for the decision outcome was the Secretary of State for Scotland, a politically appointed national government cabinet minister. Very few planning applications are destined for ministerial consideration (by the Secretary of State for Scotland in the case of developments in Scotland; by the Secretary of State for the Environment or for Wales for developments elsewhere in the UK). Development applications involving issues of national importance are automatically notified to the minister (in practice this has included all major oil-related developments in Scotland), who may use his discretion in deciding whether to "call them in," and thereby assume the role of decision taker under the Town and Country Planning (Scotland) Act 1972. It is usual for major new oil-related applications to be called in for ministerial determination (the Flotta oil terminal in the Orkneys and the Nigg Bay gas facilities were two exceptions in this respect), and thus the Mossmorran-Braefoot Bay "call in" was in the normal course of events.

A change in national government in May 1979, three months before the final decision of approval saw the replacement of the Labor Minister, Bruce Millan, by the Conservative Minister, George Younger, as Secretary of State for Scotland.

Although final judge of the outcome, the Secretary of State does not witness the decision proceedings directly. His is a "behind closed doors" decision, based on written submissions from parties involved, a summary and recommendations of any public inquiry (more on public inquiries in Chapter 5), national issues relevant to the case, his discretionary appraisal of additional representations that may be lodged with him and any further information he deems it suitable to request. He is aided by legal and other internal advisers.

The Secretary of State for Scotland operates through the Scottish Office, and the Scottish Development Department is the department within the Scottish Office which acts for the Secretary of State in the capacity of development control authority for planning applications which are called in by him. This administrative role includes setting up any Public Inquiry, including the appointment of the Reporter, and coordinating the passage of information between the Secretary of State and other parties to the decision.

The Scottish Office is an "omnibus" department with functions for Scotland that incorporate those of several individual government departments for the rest of the UK. In addition to their administrative role in relation to development control, another function of the Scottish Development Department significant to the present decision relates to forward planning in Scotland. One of its functions in this respect is to guide and to encourage the establishment of North Sea oil and gas related developments in Scotland. Although this does not extend to an explicit location

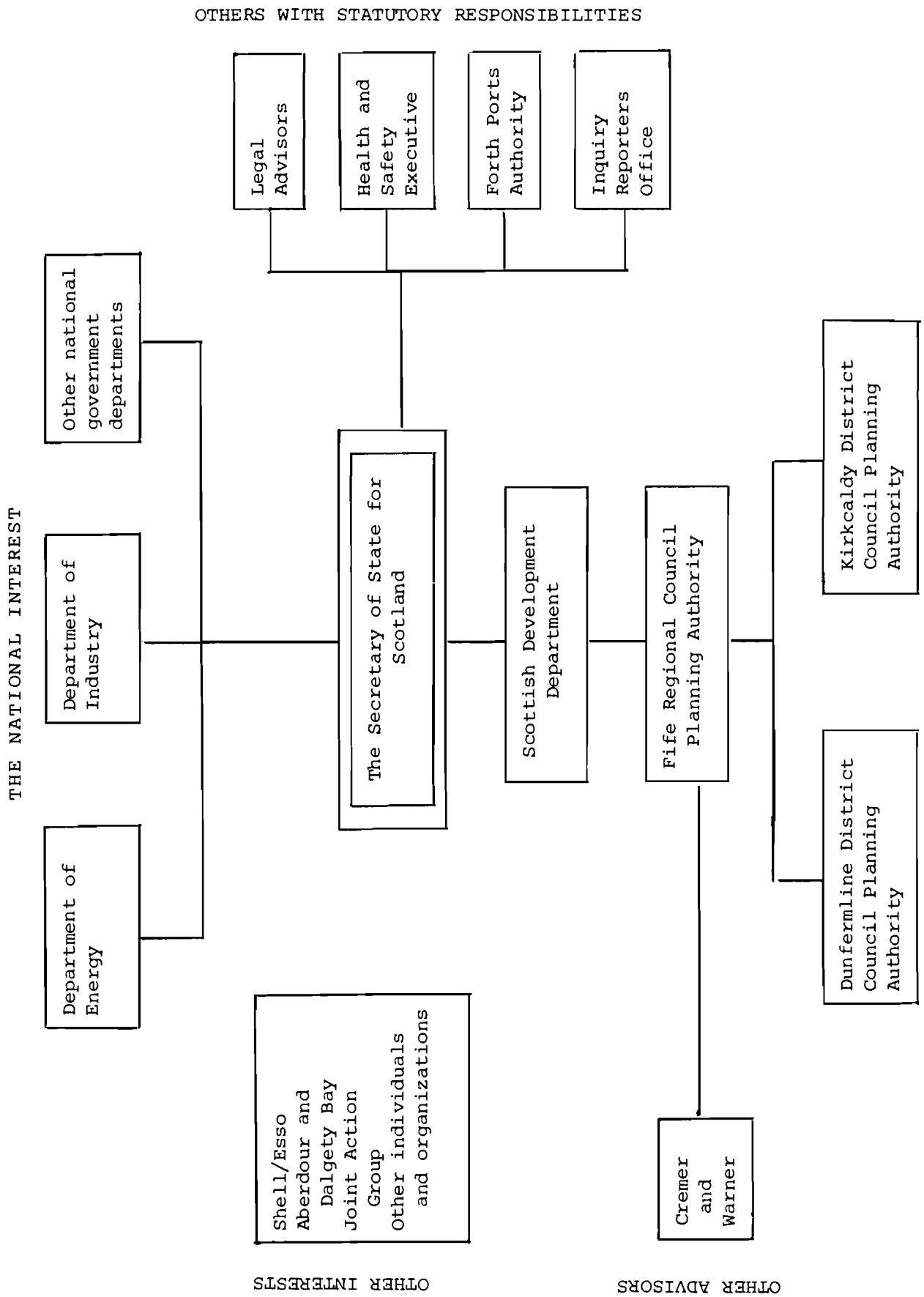


Figure 2.5. The main official decision hierarchy.

policy there has long been a call for one (Department of Industry 1976, various press reports). Its site evaluation is one of satisfying rather than optimizing, i.e., a site can be considered suitable for a given purpose as long as it meets (satisfies) a number of relevant criteria; it does not necessarily have to be the best (optimum) in relation to those criteria.

The roles of development control and development planning can be mutually complementary, and considerations of efficiency would suggest that possible conflict between policy (or development planning) and administration (development control) should be minimized. This suggests a preference towards a decision approval for the Mossmorran-Braefoot Bay applications and raises the issue of whether the Scottish Development Department can be expected to (or indeed, should) be completely impartial in undertaking its official administrative job as independent arbiter of any conflicts arising in the decision process. The strong national interest arguments in the Mossmorran-Braefoot Bay case are also likely to find support from the Scottish Office.

Of the various civil servants within the Scottish Office involved in the decision process, the Inquiry Reporter deserves particular attention. As will become evident below, a Public Inquiry was to become the centrepiece of the decision process, as the main forum for individual parties to present their cases for or against the developments, and to cross examine statements made by others. The Public Inquiry is presided over by a Reporter, sometimes assisted by a technical assessor, whose role is to direct the proceedings, summarize them and present his findings and recommendations to the Secretary of State. The Reporter in the Mossmorran-Braefoot Bay case, was highly respected by the main parties involved.

Various national government departments were consulted about various aspects of the developments--the Department of Agriculture for a reaction to farming consequences; the Department of Employment for a reaction to job prospects--and those most directly interested in the decision outcome (and hence in monitoring the decision process) were the Department of Energy and to a lesser extent the Department of Industry. The Mossmorran-Braefoot Bay proposals would contribute to the stated aims of national energy policy in relation to North Sea exploitation by allowing a more efficient use of the hydrocarbon resources of the Brent oil and gas field. Foreign markets for the end-products from the Mossmorran-Braefoot Bay installations would ensure a positive contribution to the UK balance of payments. The national prestige of the developments is also important (see Chapter 3.2).

The views of national departments were communicated through the normal course of official and unofficial interdepartmental exchanges, and apart from initial brief statements (see below) were not open to external observation. In particular, representatives of these departments were not present at the Public Inquiry.

At the local level, two tiers of government may be identified: Regional and District (see Local Government (Scotland) Act 1973). The Mossmorran site straddles the boundary between Dunfermline and Kirkcaldy Districts, Braefoot Bay lies within Dunfermline District, and both Districts lie within the Fife Region. These three local authorities

were thus directly involved in the Mossmorran decision.

The District Council is the usual development control authority (i.e., administrative unit) for planning applications; it is at the District level that all such applications are initially lodged. The District Council must publicize all potentially contentious applications, consult all potentially interested parties, and notify the higher tiers of authority (Regional Council or Scottish Office) of any applications that carry significant implications likely to extend beyond the District boundary. For applications that are not called-in following such notification, the District Council would retain overall administrative (and decision-taking) responsibility. For those that are called-in the District Council would communicate its own views alongside those of other parties to the decision.

The local district and regional councils were all to support the Mossmorran-Braefoot Bay developments and co-ordinated their consideration of them, there being no substantial differences in interest. Crucial in their consideration of the safety aspects of the proposals was their appointment of the private firm of chemical, engineering, and scientific consultants, Cremer and Warner, to advise them on safety, and environmental nuisance aspects of the planning applications. The main report produced by Cremer and Warner (1977) was referred to extensively throughout the decision process as it was the most detailed hazard assessment carried out at the time.

The regional and district councils consist of members elected democratically by the local population (relevant local authority elections are held every fourth year. Planning applications may be determined by the full council (as in the present case) or delegated to their respective planning sub-committees (meeting monthly, advised by officers from local planning departments). Apart from individual consideration by each regional and district authority, joint liaison committees co-ordinate consideration of planning developments which may affect several districts.

In addition to the above mentioned tiers of local and national government, two further statutory authorities, the Health and Safety Executive and the Forth Ports Authority were directly involved.

The Health and Safety Executive is the statutory UK guardian of safety: a national regulatory body responsible for the implementation of the Health and Safety at Work (etc.) Act 1974 and any subsequent regulations stemming from this Act. The general provisions of this Act and associated regulations are that operators of potentially hazardous activity must ensure, so far as is reasonably practicable, that neither their employees nor the public are exposed to risks to their health or safety as a result of their activities. As well as its regulatory role, the Health and Safety Executive undertakes advisory work, including advice to local authorities (and the Secretary of State in the case of "called in" applications), on planning matters relating to potentially hazardous installations.

In particular, since 1972 there has been a voluntary arrangement between local authorities and the Health and Safety Executive (or its predecessor, the Factory Inspectorate of the Department of Employment) for the former to consult the latter about planning applications for major hazard installations, and for other applications in the vicinity of such installations. The voluntary arrangement will become statutory from

August 1981. The nature of the Executive's advisory role has undergone some significant changes in recent years, though a full account of these goes beyond the scope of the present report.

The Health and Safety Executive are funded by the Department of Employment, but are internally responsible for allocating their grant between their various activities. They are keen to stress their independence of government policy and of other government departments.

The Health and Safety Executive are satisfied that the powers available to them under the Health and Safety at Work Act are sufficiently strong for the job they are required to do. The ultimate power is that a prohibition notice can be served on any operators of installations whose activities do not meet the requirements of the Health and Safety at Work Act (the Act includes provision for any necessary information to be obtained by Health and Safety Executive, or necessary inspection to be carried out by them); difficulties are normally resolved without recourse to this power.

The Forth Ports Authority are statutorally responsible for (a) piloting and shipping safety in the Forth Estuary (it is a compulsory pilotage area--except for naval vessels--and there would be no question of commercial ships entering Braefoot Bay without a pilot); and (b) leasing the jetties on the Forth Estuary (it is Forth Ports Authority policy to own large jetties themselves and to lease them to operators in discharging their functions). It was thus necessary for the Forth Ports Authority to approve of Braefoot Bay as a suitable site for the marine terminal (they appeared to have no hesitation in so doing), and to be satisfied that they had sufficient powers to ensure that gas tankers could be handled safely in the estuary. They appeared to have no reservations on this latter count, particularly in view of recent legislation, "The Forth Ports Authority Confirmation Act 1980" which strengthens their previous powers in implementing recommendations made by the National Ports Council (Hazardous Cargoes in Port Approaches 1976).

The remaining main parties to the decision were public interest groups opposed to the developments, notably from residents in Aberdour and Dalgety Bay, two villages each with an estimated population of 3,000 whose built up areas extended within a mile of the proposed terminal at Braefoot Bay (see Figure 2.4). A combined Action Group was formed from the Aberdour Residents and Dalgety Bay Ratepayers Associations to coordinate opposition from these villages. Opposition was initially based on environmental, amenity and safety grounds, though safety considerations soon became dominant, to the exclusion of other factors. The role of the Action Group became to increase the thoroughness and degree of detail with which safety considerations would be (or would be seen to be?) handled. Their cause could be appraised as stemming from genuine concern for the safety aspects of the Braefoot Bay terminal, or, more cynically, as a desperate attempt on behalf of a self-interested community to use all possible means within the law to rid their neighborhood of the proposed terminal, safety being the grounds on which they would be most likely to succeed. Their campaign was mounted almost exclusively on a verbal/intellectual, rather than a physical or theatrical level, though one of their number who had previously been involved in opposing a Public

Inquiry in a different context drew attention to the noise and disturbance that it would have been possible to cause on that previous occasion using the 25,000 british pounds sterling spent on an unsuccessful, peaceful campaign. It is notable that the intensity and "professionalism" of "public" opposition to the proposed developments, to a degree far beyond the expectations of other parties involved, stemmed almost exclusively from local residents rather than a national environmental group.

The Action Group considered it neither necessary nor appropriate to call on the assistance of the Friends of the Earth or other national environmental lobby. It was considered unnecessary in view of their own "indigenous" expertise which in their view more than matched what was likely to be available in other lobbies: Rasbash, the Professor of Fire and Safety Enginering at Edinburgh University offered his services and became their main expert witness at the Public Inquiry; other individual residents in Aberdour and Dalgety Bay had legal and technical skills. It was considered inappropriate because the issues they were fighting were strictly local (thus 'routing a mob' from other campaigns would not be thought to benefit their cause), and in any case other national lobbies were heavily committed to the Windscale Inquiry, which was to take place at the same time as that for Mossmorran-Braefoot Bay.

It is difficult to assess accurately the extent of support for the Action Group lobby among the population of Aberdour and Dalgety Bay, it would appear, from discussions with other main parties, and from informal student interviews there, to have been widespread (and by no means confined to the main activists in the Group); a formal survey has not, however, been undertaken.

Not all objections from the public were voiced through the Action Group. The Conservation Society (concerned on safety, ecological and historical grounds), various yachting clubs (concerned about the interference of the marine terminal with their pleasure craft), Gray Park Tenants Association (local authority tenants on a small estate to the edge of the Mossmorran site--see Appendix 2 for their dilemma), and many other individuals were to make their own representations and protests (see section 4.9).

Other parties took less prominent roles: the silent majority in Cowdenbeath, a town with a population of about 10,000 and a high unemployment rate, roughly a mile away from Mossmorran, firmly in favor of the developments: M.P.'s of all parties with their own individual interests and views, though with the exception of the M.P. for Dunfermline, who gave evidence to the Inquiry, with no formal part in the decision process: academics of various complexions; the press and the media (extensive coverage in the Scotsman; also featured in other newspapers, television programs--the last mentioned broadly unfavorable to the official position).

2.4. THE MAIN EVENTS IN THE DECISION PROCESS

As already suggested, the evolution of the decision process is constrained in general terms by the procedures laid down in the Town and Country Planning (Scotland) Act 1972, and indicated in the flow diagram in Figure 2.6. Routine statutory procedures are explained more fully in Chapter 5.2. A Public Inquiry into the applications had been anticipated by all main parties, affording a principal opportunity to present their own cases and to cross examine the cases of others. This became the centre-piece of the decision process and divided it into three distinct stages: pre-, intra-, and post-inquiry. There was no overall time constraint on the duration of the decision process as a whole, though certain procedures within it were bound by statutory time constraints (see below).

Parties were actively involved to varying extents throughout the decision process. A diary of principle events is given in Table 2.2. The lodging of formal planning applications (January, February 1977) subdivides the pre-Inquiry period; before then consideration of the proposed developments by the main parties had been essentially informal; thereafter, consideration became more formal, in line with statutory procedures, and the main formal analyses were prepared. The period following the Public Inquiry, July 1977 until August 1979, again subdivides into two. Until December 1977 a normal course of events was being followed--the Inquiry report had been received for consideration by the Secretary of State and his final decision was awaited. However, in January 1978 a new issue was raised, namely a potential ignition hazard posed by break sparks from radio transmissions. Consideration of this issue delayed the final decision until August 1979, over eighteen months later than the time at which it had been expected. A detailed decision diary is given in Table 2.3. Although for the purposes of the present report the decision process is considered to end with the decision of approval in August 1979, a number of key events which occurred since then are recorded in Table 2.4.

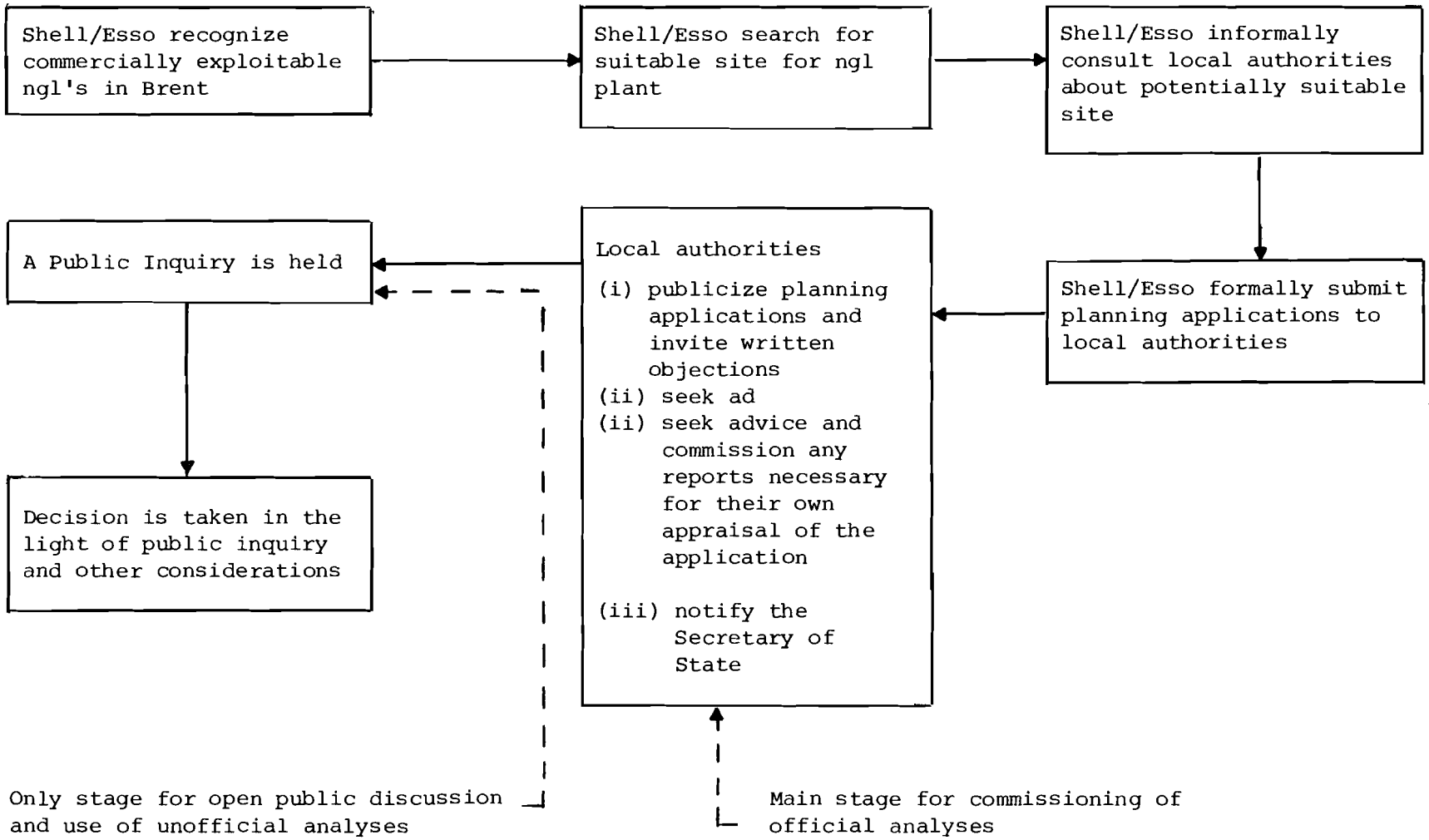


Figure 2.6. Flow diagram of decision events.

Table 2.2. Decision Diary: Principal Events

July 1976	Shell/Esso contact Fife local authorities to discuss the potential of Mossmorran to accommodate n.g.l. plant and ethylene cracker.
November 1976	Shell declare intention to submit planning applications for sites at Mossmorran and Braefoot Bay
January 1977	Esso declare intention to submit planning applications for sites at Mossmorran and Braefoot Bay
	Shell submit planning applications for n.g.l. plant and associated facilities
February 1977	Esso submit planning applications for ethylene cracker and associated facilities
	The Secretary of State "calls in" the n.g.l. plant application
March 1977	Esso submit a planning application for the downstream development of the rest of the Mossmorran site
	The Secretary of State "calls in" the ethylene cracker application
April 1977	The Secretary of State "calls in" the downstream development application.
June-July 1977	A Public Inquiry into all applications is held
November 1977	The Inquiry Reporter submits his report to the Secretary of State
March 1978	The Secretary of State indicates his provisional approval of the planning applications, but asks for further evidence on the radio-spark ignition hazard
August 1979	The Secretary of State gives his approval to the developments, i.e., grants outline planning permission, subject to a large number of conditions.

Table 2.3. Decision Diary: Principal and Supporting Events

DATE	EVENT	COMMENTS
1971	Brent oil and gas field discovered.	
February 1976	Planning application submitted by Shell for n.g.l. plant at Peterhead and called in by Secretary of State	See Appendix 1
May 1976	Public Inquiry into the n.g.l. plant application at Peterhead begun but adjourned in June at the request of Shell (unsuitable harbor conditions)	
July 1976	Shell/Esso contact Fife local authorities to discuss the potential of Mossmorran to accommodate n.g.l. plant and ethylene cracker (Fife 1977)	Very swift choice of alternative site.
October 1976	Dalgety Bay residents association reported to have alerted local population to the hazard potential of the plants. Concern also voiced over yachting and other amenities, environment and ecology (Scotsman 28.10)	Immediate opposition.
	Local district and regional councillors voice approval.	Immediate approval.
November 1976	Aberdour Ratepayers Association are instructed by their members to protest to the Secretary of State in the strongest possible terms. Concern expressed over yachting and marine safety.	
	Shell withdraw their n.g.l. plant application for the site at Peterhead, and delcare intention to submit the application instead for the Mossmorran-Braefoot Bay sites. Local government leaders unanimously welcome the plan (Scotsman 10.11), since potential employment benefits will far outweigh potential environmental costs.	
	Opposition to the proposals from Aberdour and Dalgety Bay grows, with fears voiced on safety, scepticism expressed on job prospects, doubts raised about 'independence' of local authorities in adequately assessing hazard and environmental impact, cynicism expressed over relevance of Public Inquiries.	Early mistrust of local authorities and of decision procedures.
December 1976	There is said to be a $500 M 10 year contract for Shell to supply propane and butane to North America.	Officially, this would not affect decision process
	Shell and Esso, encouraged by the local authorities, held public meetings in Dalgety Bay (10th), Cowdenbeath (13th), Aberdour (14th) (also in Auchtertool on January 10th), to explain their proposals.	
	Conservation Society call for a planning inquiry commission.	Conservation Society dissatisfied with UK Public Inquiry procedures.

Table 2.3. (continued)

DATE	EVENTS	COMMENTS
January 1977	Esso declare intention to submit planning application for ethylene cracker at Mossmorran and associated pipeline facilities to and berthing facilities at Braefoot Bay.	
	The Fife local authorities brief Cremer and Warner (private independent consultants) to report on the hazard and environmental impact of the Shell/Esso proposals.	The Cremer and Warner report was to be the most substantial one produced on hazard during the decision process.
	(20th) Shell formally submit n.g.l. plant application to Dunfermline and Kirkcaldy District Council.	
February 1977	(7th) Secretary of State 'calls in' the planning application for the n.g.l. plant.	The Secretary of State thus becomes "THE" decision taker.
	(24th) Esso formally submit ethylene cracker application to Dunfermline and Kirkcaldy District Council.	
	Aberdour Ratepayers and Dalgety Bay Residents Associations combine to form a Joint Action Group to fight the proposals. They re-direct earlier fears to the Scottish Development Department and ask, formally, for a Planning Inquiry Commission (since the call in, the development control authority for the proposals).	Request refused.
March 1977	(1st) The Secretary of State 'calls in' the ethylene cracker application.	
	(21st) Esso submit planning application for downstream industrial development on the Mossmorran site.	
April 1977	(5th) The Secretary of State 'calls in' the planning application for downstream industrial development.	
	Public exhibitions are held by Shell, Esso and local authorities in Dalgety Bay and Auchtertool to explain their proposals in greater detail.	
	(18th) Meeting of Kirkcaldy District Council agrees that the 'balance of advantage' lies in approving the gas plant applications.	First official reaction from Kirkcaldy
	Joint Action Group ask Scottish Development Department to discuss with them possible alternative sites for the proposals. Little reaction. Objectors consider odds to be stacked against them.	Secretary of State cannot talk to individual parties once the applications are formally before him.

Table 2.3. (continued)

DATE	EVENTS	COMMENTS
May 1977	(6th) The Scottish Development Department announce that a Public Inquiry into all three applications is to open in Dunfermline, 13th June 1977.	Later postponed until 27th June at objectors request.
	Cremer and Warner Hazard and Environmental Impact Report is received by the local authorities.	
	The local authorities issue their joint report describing the proposals and assessing their potential economic, land-use, environmental and hazard impact.	
	(31st) Action Group mount exhibition in Edinburgh to publicize danger of plant.	
	(31st) A meeting of Dunfermline District Council officially approves the planning applications in principle (subject to a number of planning conditions).	Unanimous
	(31st) A meeting of Fife Regional Council officially approves the planning applications in principle (subject to a number of planning conditions).	Unanimous
June 1977	(4th) The Inquiry Reporter (Mr. Bell) hólds a pre-Inquiry meeting in Dunfermline to decide a suitable order for and timing of the cases by the various parties. Also to ask for advance written statements from the main parties. Local authority representatives visit Stenungsund.	
	(10th) Joint Action Group ask for a further postponement of the Inquiry. Not granted.	
	(27th) Public Inquiry opens.	
July 1977	(21st) Public Inquiry closes.	
November 1977	Inquiry Reporter submits his summary of the Inquiry Proceedings and his conditional recommendation of approval to the Secretary of State.	Parties have had the opportunity of commenting on the factual accuracy of summary.
	Secretary of State, in answer to a question raised in Parliament, said that he expected to announce his decision before the end of the year.	
January 1978	(24th) Joint Action Group raise the issue of radio-spark ignition hazard (in a letter to Secretary of State)	An issue completely overlooked at the Public Inquiry

Table 2.3. (continued)

DATE	EVENTS	COMMENTS
March 1978	(6th) Health and Safety Executive reply to the issue of radio-spark ignition hazard, stating the view that "there is certainly no need for planning permission to be held up on this count."	
	(29th) Secretary of State announces his provisional view that planning permission should be granted, subject to a range of conditions, but asked for further representations from parties on the issue of possible hazards from radio transmissions. These representations were to be made within 28 days.	The Public Inquiry Report was issued with this decision. Only representations relating to radio-sparks could be submitted from this time.
April 1978	(21st) Cremer and Warner report to the Fife local authorities on the question of radio transmissions hazard.	
	Representations received by the Secretary of State on the issue of possible hazards from radio transmissions sent to the Health and Safety Executive as they arrived.	
June 1978	(2nd) The Court of Session in Edinburgh rules that a report on radio-spark ignition hazards (The Excell Report) held by the Scottish Development Department should be released to the Action Group.	
July 1978	Health and Safety Executive's report on radio hazards sent to the Secretary of State.	
August 1978	(2nd) The Health and Safety Executive report, together with other representations received on radio transmissions, are circulated by the Scottish Development Department to all parties, who were given an opportunity to make further representations by 4th September.	
September 1978	(8th) Comments were received from objectors criticizing the Health and Safety Executive Report. Objectors applied to the Court of Session for an extension of the time limit set in August for further representations following refusal by the Secretary of State to allow additional time.	
	(25th) Secretary of State extended the time limit for further comment until 24th October, and the Action Group agreed to withdraw the Court application upon payment by the Secretary of State of the Group's legal costs.	
October 1978	The further representations received on radio-transmissions made it necessary to obtain further information from the Health and Safety Executive.	

Table 2.3. (continued)

DATE	EVENTS	COMMENTS
January 1979	A Fife Councillor estimates the delay in decision to be costing the nation £200 million a year,	Not verified either by oil companies or by Government
	'Shipping hazards', a quantitative assessment of the marine hazards at the Braefoot Bay terminal, is published by the Action Group.	
March 1979	(12th) New material from the Health and Safety Executive is circulated to parties, who are given until 18th April to make further comment on the radio-transmission question.	
April 1979	Further material from the Health and Safety Executive resulting from questions raised by the objectors is circulated to parties.	
May 1979	(3rd) General election and change of national government; the Labour minister Bruce Millan is succeeded by the conservative minister, George Younger, as Secretary of State for Scotland.	
	Short parliamentary debate on Mossmorran.	Discussion curtailed because it is improper to debate the merits of the case before the decision is taken
June 1979	(8th) Further material from the Health and Safety Executive resulting from questions raised by the objectors is circulated to parties.	
	(19th) Representatives from the Action Group go to London to present their case directly to M.P.'s at Westminster. Few attend.	
August 1979	(9th) The Secretary of State announces his decision of approval.	

There was much behind the scenes activity between state authorities on these and other matters; but it has not been possible to include this.

Table 2.4. Post-decision diary.

October 1979	Action group lodge an appeal with the Court of Session against the validity of the decision of the Secretary of State, on the ground that it was not within the powers of Section 32(1) of the Town and Country Planning (Scotland) Act 1972
December 1979	Parliamentary debate on safety aspects of Mossmorran-Braefoot Bay initiated; abandoned for exceeding time limits.
February 1980	(14th) Court of Session reject Action Group's appeal against the Secretary of State
March 1980	Esso lodge planning application to build ethylene cracker at an alternative location within the Mossmorran site.
	Construction work on the ngl plant commences
October 1980	Esso announce firm intention to proceed with the construction of the ethylene cracker
	Public Inquiry into St. Fergus-Mossmorran pipeline

CHAPTER 3:
THE DIMENSIONS OF THE DECISION

3.1. STATEMENT OF DIMENSIONS

The material considerations of the decision may be grouped under four broad headings:

(1) National benefits

(2) Local socio-economic benefits

(3) Health and Safety aspects

(4) Environmental factors.

All but the first are site specific. The different party perspectives on each of these four dimensions will be presented in the next chapter. Meanwhile the four dimensions will be explained in more detail.

3.2 NATIONAL BENEFITS

The following submission was made in 1977 on behalf of the Department of Energy and issued via the Scottish Development Department in June of that year in order to identify the relationship of the proposed Mossmorran-Braefoot Bay developments with the "national interest." Apart from a supporting note from the Department of Industry, this was the only written statement on the national interest, and is brief enough to be repeated here in full.

1. It is the Government's policy to seek to obtain maximum value from North Sea hydrocarbon resources and it recognizes the potential economic contribution of an expanding petrochemical industry based on a secure feedstock source.

2. An essential feature of the development program for the Brent field will be the construction of an NGL separation plant and associated shipping terminal. The Brent production system will eventually comprise an oil pipeline to Sullom Voe and a gas pipeline to St. Fergus. At the latter site specification gas (mainly methane) will be taken out to supply the companies' contract with the British Gas Corporation. Facilities will also be required to handle and market the other heavier gases (the NGLs), which means that there has to be a plant to separate them from each other and a terminal to ship out the propane and butane, much of which is likely to be sold in overseas premium markets. The developments covered by the Shell application therefore from part of a highly complex and integrated operation and will be required by 1980 in order to fit in with the overall development program for the Brent field.

3. Disposal of the ethane is a key feature of such a program. The intention is that the Esso cracker at Mossmorran will take the ethane from the NGL separation plant for the manufacturer of ethylene. A development of this kind would be advantageous in terms of Government policy and industrial strategy, as would the further development of related downstream processes at Mossmorran which is envisaged in the second Esso planning application. Ethylene is one of the principal basic petrochemicals and is used in numerous processes to produce a wide range of consumer products.

4. If alternative outlets had to be sought for the ethane, export would not commend itself because the costs involved would be heavy and almost certainly uneconomic. Flaring would clearly be wasteful. If considered for fuel use (for which its value would be less than if used as a feedstock) some surplus ethane might be taken by the British Gas Corporation, but it is likely that some would have to be used as a power station fuel. This could be acceptable for a year or two to bridge any gap between the commissioning dates of the NGL separation plant and a cracker. Prolonged delay at the planning or construction stage, and even more a situation where the cracker was not built, would however have adverse consequences for the Scottish coal industry and for national energy policy.

5. The present proposal for a cracker should also be seen in the context of the report of the Organic Sector Working Party of NEDO in relation to the Industrial Strategy. That report saw a major opportunity for an expansion of the UK petro-chemical industry, requiring by 1985 the construction of 4 new ethylene crackers in addition to the one under construction for ICI on Teeside. The Secretary of State for Industry, endorsing the Sector Working Party's recommendations explained that 4 crackers would not only be needed to meet the expected growth in UK consumption but would also make a major contribution to the balance of payments through exports. He emphasized that it would be in the national interest that the right

projects took place at the right sites, on time and on a commercially viable basis.

6. Relevant Government guidance of a general nature has been given to planning authorities in the Scottish Development Department's "North Sea Oil and Gas Coastal Planning Guidelines" published in August 1974. Preferred development and conservation zones were identified: parts of the Forth Estuary were included within a preferred development zone. Most recently the issue of National Planning Guidelines in May 1977 has given further planning guidance. Copies of the Guidelines are enclosed. It should be noted that the Guidelines are expressly declared not to be intended to override the provisions of existing development plans nor to prejudice the decision of the local authority or the Secretary of State on individual planning applications.

It is clear from the above statement that it was officially said to be in the national interest for developments such as those proposed for Mossmorran-Braefoot Bay to go ahead, though none of the national benefits are directly site-specific.

Various attempts at quantifying these national benefits appeared from time to time during the decision process. The most popular of these referred to net export earnings from propane, butane, and ethylene (assuming all would go to export markets) of 260 million pounds stg. a year at 1977 prices. The later export of ethylene derivatives from downstream industries would fetch considerably higher earnings still. Since Shell and Esso are private companies, national benefits from this source would arise indirectly in terms of balance of payments contributions. Attempts to put a value on such earnings are fraught with difficulties, not least through significant fluctuations in the world market price of the gases in recent years. It is even more treacherous to attempt to put a value on the cost to the nation of a longer than usual decision process (more on this below). Further monetary benefits to the nation (as distinct from local socio-economic benefits) would arise from tax and royalty revenues (i.e., income to the national exchequer) that are levied on all North Sea production. However, these are considered to be small in relation to corresponding revenues from Brent oil (compare 3×10^6 tons per annum natural gas liquids with 20×10^6 tons per annum oil).

Against such possible national benefits should be set the national monetary costs to be incurred. In this case this would include government grants amounting to 20% of the construction costs of the natural gas liquids plant (estimated total cost in 1979 of 200 million pounds stg.) and of the ethylene cracker (estimated total cost in 1979 of 250 million pounds stg.), other (possibly quite considerable) capital allowances, and the "adverse consequences for the coal industry and for national energy policy" (see paragraph 4 above) if the cracker was not built.

Apart from overall monetary cost-benefit calculations such as those indicated above, a further national benefit from the project and arguably the most significant, was that of prestige. Although no written statement appeared, this aspect probably became increasingly important as the

decision process became increasingly prolonged. A government which had stated its commitment to encourage petro-chemical industries in the UK was to be seen supervising a decision period of two and a half years, between their initial "call-in" of the applications and their final decision of approval. Nine months would have been a more appropriate decision period. The psychological cost to the nation (in terms of discouraging other, particularly oil related, investment by multi-national companies in the UK) of a decision that went against the oil companies after such a big decision process could have been disastrous.

There would be no forum in which the national merits of the project could be openly discussed; in particular they were excluded from consideration at the Public Inquiry (debate of merits of government policy is *usually excluded* from Public Inquiries). There was no subsequent updating of the above official statement in the light of changing national and world circumstances over the period of the delay.

3.3. LOCAL SOCIO-ECONOMIC BENEFITS

These would undoubtedly be the main benefits of the project at the local level; a large scale development (700 acre site is large by any UK standards); a prestigious industry, modern technology and offering diversification to the existing industrial base of the region. The UK chemicals industry was recognized as the healthiest sector of British industry, having over the last decade grown about twice as fast as UK manufacturing industry as a whole. The construction phase of the plant had been estimated to generate directly (on site) up to 3,350 jobs, with a considerable number of additional jobs arising via subcontractors and indirect supplies. The operational phase of the NGL plant would employ about 100 people and the ethylene cracker about 250. Additional spending power generated locally by wages paid to employees would also create more employment in service industries during both construction and operating phases.

The preliminary appraisal of the local employment impact from the construction phase in the joint council's report (Fife 1977) was a favorable one. Although it was difficult at the time to estimate with accuracy the increase in local income which could be generated by successful local bids for sub-contracts, and the ability to supply relevant skills from the local area for the construction phase of the NGL and ethylene cracker, a significant expansionary effect on the local economy was foreseen. Taking account of the present low level of activity in the construction industry much of the required labor would probably be available in the Fife Region. Moreover, "It has been suggested that perhaps in the region of 50% of the wage bill during the construction phases and about 60% subsequently could be subject to a multiplier effect of somewhere between 1.2 and 1.5" (Fife 1977). The local authorities asked the oil companies early in 1977 to undertake as a matter of urgency a study of construction skill requirements, and to use as much local labor as possible.

In the operational phase of the NGL plant and ethylene cracker there would be, as noted above, significantly fewer jobs (of the order of 350 in all) and many would of necessity be filled by existing Shell/Esso employees. Again, however, the companies undertook to employ (and train in some cases) some local people.

The fear expressed by some local firms supplying similar types of labor that they may suffer from increased competition for craftsmen, and indeed loose key personnel, could be counterbalanced by advice from the Department of Employment indicating that recent experience in areas in the UK affected by large-scale oil-related developments such as Aberdeen and Methil has shown little, if any, evidence of the collapse of local firms. Moreover, it was said that if the effect of oil company competition for indigenous skills is to increase the general wage level in the region, then the overall increase in regional wealth thereby achieved could be counted as a further benefit.

The Mossmorran site lies adjacent to Cowdenbeath, an area which has suffered severe employment problems since the decline in the coal industry; about 60% of the working population were employed in that industry in 1961, falling to 13% in 1968. Unemployment rates for Cowdenbeath in April 1977 were estimated at 19.3%, compared with 7.8% for Scotland as a whole. Mossmorran was seen to be an important site in terms of achieving a solution to these unemployment problems. It had been identified as one of only three sites within the Fife region which could accommodate industrial development on a significant scale, particularly large, single industries.

Possible downstream plastics industries (application (c)) using ethylene as a feedstock and generating upwards of 1,600 permanent jobs once established might considerably boost the socio-economic benefits. The ethylene cracker would be the springboard for those industries, and Esso had bought additional land on the Mossmorran site in order to accommodate them. Any enthusiasm about this considerable bonus, the downstream lollipop, had to be tempered by the uncertainty surrounding it: views varied over the likelihood that these industries would become established, given the state of the world ethylene/plastics industries and markets (current over capacity but a possible upturn in the future).

Other potential socio-economic benefits would be less significant than the aforementioned. Any increase in local authority rate revenue to result would be matched by an equivalent reduction in the rate support grant received from the national exchequer. However, although no net increase in local rate would result directly from the proposed developments, there would be some advantage to the local authorities stemming from the fact that there is an element of direct government control over spending of funds from the rate support grant, but no such control over local authority spending of directly levied rates.

A final potential socio-economic advantage of the proposed developments might be a psychological one, paralleling the prestige argument at the national level. The development of modern industry on such a large scale is bound to "put the place on the map;" an advertisement of Fife for the outside industrial world. These benefits might dwarf any loss in tourism income through loss in amenity at Aberdour and Dalgety Bay,

although such intangible considerations at the local level were in turn completely dwarfed by the more tangible benefits of the plant already reviewed.

3.4. HEALTH AND SAFETY ASPECTS

Any activity involving the bulk handling of liquefied energy gases is potentially hazardous. The NGL plant at Mossmorran is to have a maximum intake capacity of 2.1×10^6 tons per annum, and the ethylene cracker a maximum production capacity of 0.6×10^6 tons per annum. In addition to process plant, storage facilities for propane, butane, natural gasoline and ethane are required at Mossmorran, and for ethylene at Braefoot Bay. The downstream industrial developments would provide a further potential source of hazard; however, since little detail about the nature of these industries was specified in the planning application little appraisal of the hazard potential could be offered.

The following paragraphs concerning hazard potential are taken from the findings of fact from the Public Inquiry:

> "The presence of these installations means that there is a risk of leaks of the product. As the main products, butane, propane, and ethylene are stored and shipped at very low temperatures, any escape will vaporize in air and form a vapor cloud which will dilute steadily as it drifts downwind. The cloud will pick up heat from the air and from the surface over which it travels. The degree of heat gained will increase the buoyancy of the cloud and affect its rate of dispersion."
>
> "Initially the cloud will be so rich that it will be capable of burning only at its edges. On further dilution, it will be sufficiently mixed with air to be able to burn throughout its volume. At this stage it is at its most explosive potential. The cloud mix may not be homogeneous, however, it can contain rich and lean pockets."
>
> "Unless the cloud meets a source of ignition, it will continue to flow downwind until its concentration is below its lower flammability limit, when it can no longer ignite."
>
> "If the cloud meets an ignition source before reaching the lower flammability limit, it will burn but the nature of the combustion is uncertain. It could be quiet burning or explosive burning with high over-pressures. Open flammable cloud explosions have occurred in vapor clouds resulting from the spill of tons of butane, propane and ethylene."
>
> "Factors which determine when explosion, rather than fire, will result include: the energy of the ignition source, the degree of

result include: the energy of the ignition source, the degree of mixing of gas and air within the cloud, the degree of confinement of the cloud and the chemical reactivity of the gas but the degree and effect of their interrelation in a given situation is very uncertain."

Due to the geography of the vicinity, and in particular the communities of Aberdour, Dalgety Bay and Cowdenbeath (Figure 3.1), a residual risk, however small, affects members of the public as well as industry personnel. This aspect was the crucial catalyst for the vehement and prolonged opposition to the proposals. It will be seen below that parties had different views on the thoroughness with which safety ought to be investigated at various stages in the decision process, on the criteria to be used to appraise safety, and differing levels of confidence in the official guardians of safety.

Realization of fire or explosion hazard will result from loss of containment of gas and the presence of a source of ignition--an open flame or a stray spark. Prudent safety measures, maximum credible spills, travel distances in relation to lower flammability limits of an unintentional release of gas, and likely ignition sources were discussed at some length at the Public Inquiry. However, some time after the Inquiry, the presence of a further, hitherto overlooked, ignition source was identified, namely stray electro-magnetic break sparks from radio transmissions both from a stationary commercial transmitter, and from marine (naval and commercial) traffic. As mentioned elsewhere in this report, consideration of this ignition source in relation to the hazard implications of the Braefoot Bay terminal was to prolong the decision process considerably.

3.5. ENVIRONMENTAL IMPACTS

The environmental impacts other than potential hazard, included noise, visual and marine pollution, agricultural and heritage losses; also, interference with amenity yachting in Mortimer's Deep, occasional tourism in Aberdour, and visits to Inchcolm Abbey (see Figure 3.2). These impacts relate almost exclusively to the Braefoot Bay terminal rather than the Mossmorran site.

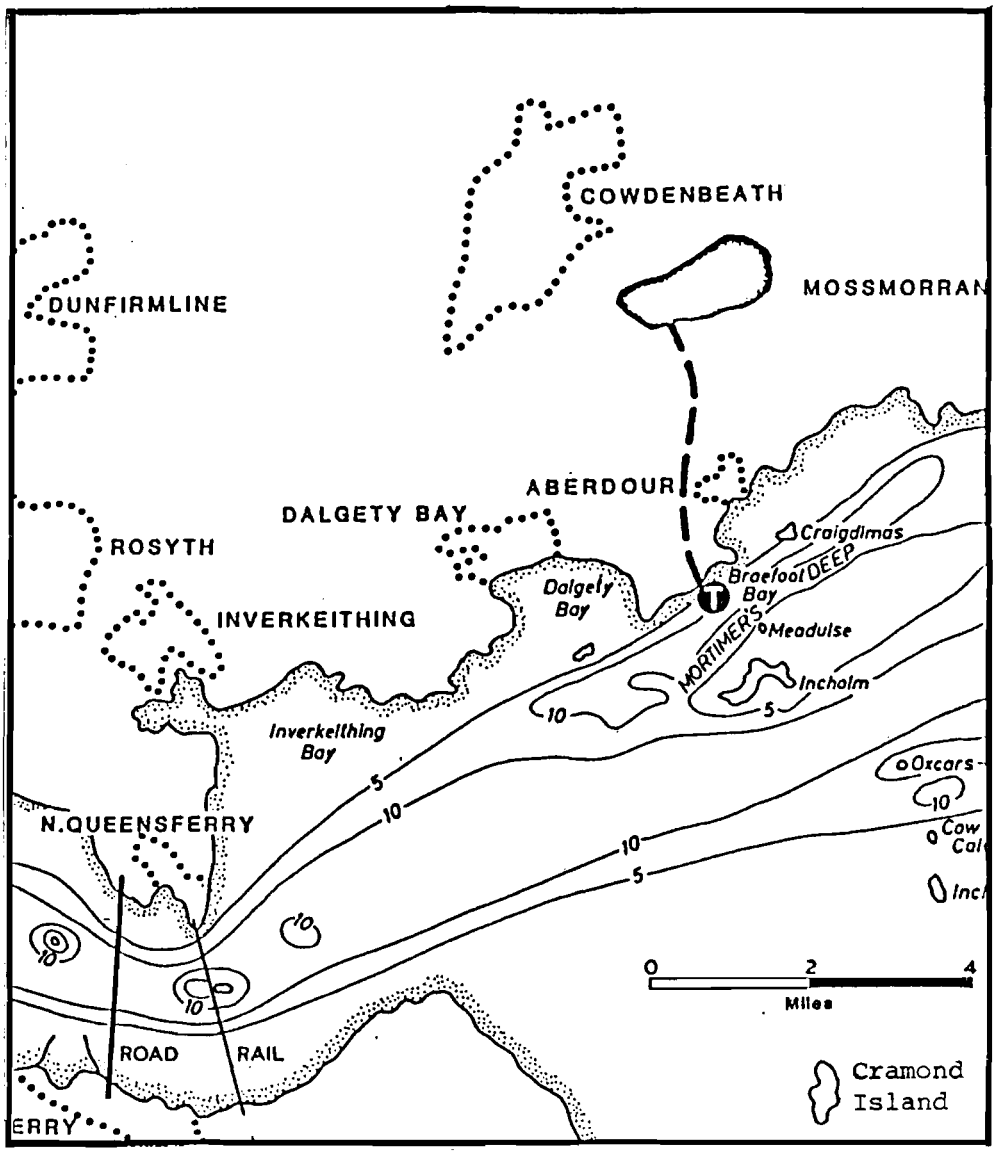
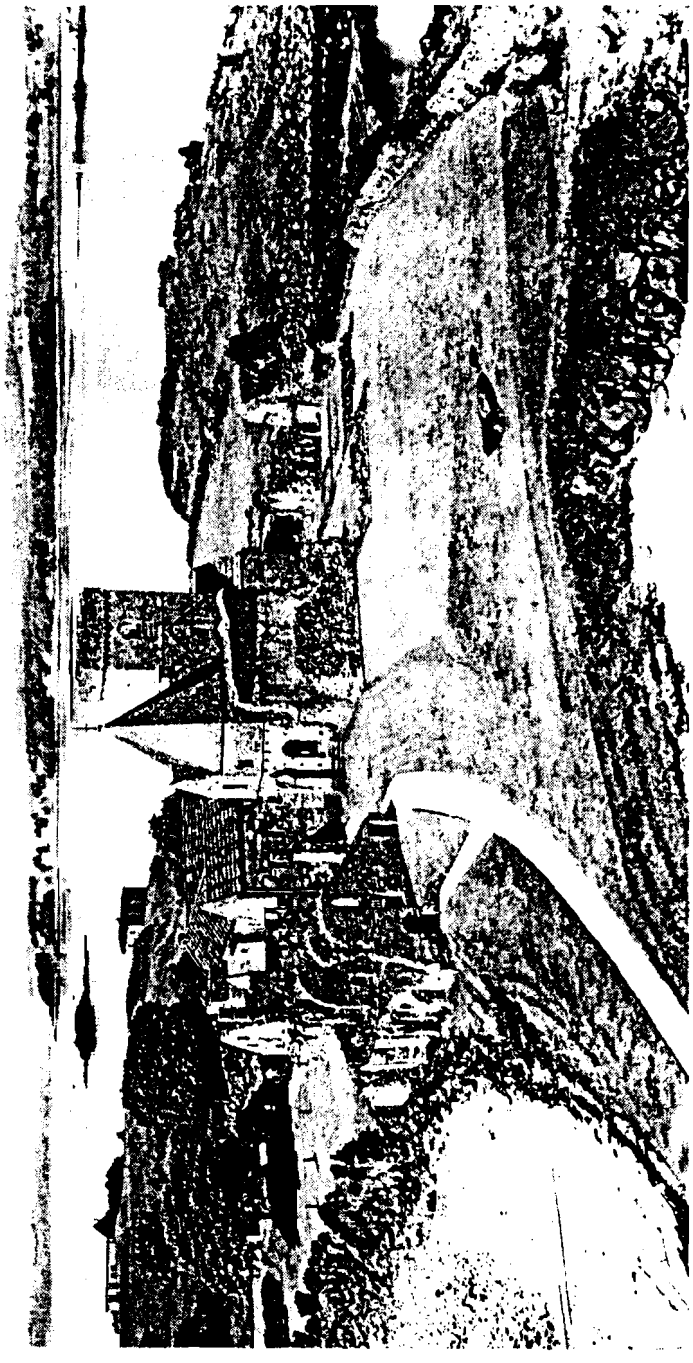


Figure 3.1. Mossmorran and Braefoot Bay in Relation to Populated Areas



Inchcolm Abbey with Mortimer's Deep and Braefoot Bay in background — "one of the most attractive features of the Forth estuary."

Figure 3.2.

CHAPTER 4:
PARTY PERSPECTIVES ON VARIOUS DIMENSIONS

4.1. OVERVIEW OF CONFLICTS

The purpose of this chapter is to review party perspectives on the main dimensions of the decision, with reference to their available information and chosen evaluation criteria. A summary of party positions is given in Table 4.1. Party conflicts over individual dimensions may be identified by considering each column in turn. There was little change in party viewpoints as the decision process evolved.

4.2. THE OIL COMPANIES: SHELL AND ESSO

4.2.1. National Benefits

This was a development for which the objectives of the companies apparently coincided with the national interest. Efficient utilization of Brent resources required facilities such as those now proposed for Mossmorran and Braefoot Bay.

4.2.2. Local Socio-Economic Benefits

Although construction contracts would have to be awarded on the basis of competitive bidding, a significant proportion of construction work force would probably be recruited locally: a condition of tendering for the major contracts would be that manpower needs in relation to local skills should be discussed with Fife Regional Authority. The local

Table 4.1. Party Perspectives on the Dimensions

	NATIONAL BENEFITS	LOCAL SOCIO-ECONOMIC ASPECTS	HEALTH AND SAFETY	ENVIRONMENT
Oil companies	Complementary -- both the nation and the oil companies would gain through efficient use of North Sea resources.	Would aim to maximize local advantage by as much local recruitment of labor and personnel as possible.	It is not in companies interests to build unsafe plant. Safety record to date is good. High specification standards, codes of practice and personnel of the highest calibre will ensure safety.	These are minimal and will be reduced as far as possible.
Local Authorities	--	The employment and local wealth implications are convincing. Important that the whole package of developments is considered (ngl plant, ethylene cracker and downstream industries); ngl plant alone would warrant considerably less enthusiasm.	Accepted advice from Cremer and Warner that plant can be designed, built and operated so as to be acceptable in terms of community safety.	Loss of amenity at Braefoot Bay a necessary sacrifice -- other potential environmental impacts are acceptable.
Department of Energy/ Industry	Prestige as important (if not more so) than more tangible benefits.	--	--	--
Scottish Development Department	To be assessed in the light of evidence from the Departments of Energy/ Industry and Employment	To be assessed in the light of all the evidence, particularly that of the local authorities	To be assessed in the light of all evidence, particularly that of the Health and Safety Executive, given the imposition of appropriate planning conditions.	A normal planning issue to be decided in the light of all evidence and the imposition of planning conditions.
Health and Safety Executive	--	--	Operators must ensure, as far as is reasonably practicable, that nobody (employee or public) is exposed to risks to their health or safety. The proposed Mossmorran-Braefoot Bay installations can meet this criterion in principle. HSE will ensure they do so in practice.	--
The Forth Ports Authority	--	--	Safety does not happen autotically, it must be worked on; FPA are satisfied that it is within their powers to ensure marine safety.	--
The Action Group	Accepts overall national benefit argument, but benefits not site specific. No trade-off tolerable between public safety and economic benefit.	Unconvinced that detrimental impact will not arise	Would accept a 10^{-6} criteria; this has no meaning, however, unless a quantitative risk assessment is undertaken and subjected to open scrutiny during the decision process. No confidence in HSE, or industry to guarantee safety. Risks appear unacceptable.	Significant losses.

availability of a construction work force had been an important, though not overriding, consideration in site choice, partly because jobs entailing the housing of imported labour would probably take longer. Furthermore, the large pool of unskilled manpower within traveling distance of the Mossmorran site made it an attractive location for downstream industrial development. Although Esso lodged planning application (c), this had been done in order to pave the way for other industrialists to develop the site, not because Esso itself intended to do so. It was said to be in Shell and Esso's interest for these industries to become established, not least because this would avoid considerable expense involved in export facilities for ethylene. It was also suggested that permanent jobs in the NGL plant and ethylene cracker, although likely to be filled initially by non-local personnel, might boost house prices; moreover the high quality of employees were likely to enrich the communities in which they lived.

4.2.3. Health and Safety

Both companies took pride in their safety practices and record to date, and issued repeated assurances that no unacceptable risk would be posed by their intended developments.

> As a company, Esso is dedicated to safety and therefore all facilities or equipment required to safeguard the public and plant personnel will be installed.
>
> Esso, through many years of design and operating experience has the necessary technology, standards and practices to design and operate safely the ethylene plant at Mossmorran and the Braefoot Bay storage and loading facility. The company has over 200 cumulative years of operating experience with similar facilities in Europe and other parts of the world. For over 30 years the company has been operating ethylene plants in Europe and other parts of the world, and in no case has there been a fire or explosion which involved members of the public. (Esso Chemical Limited, 1977)

Aspects brought out in more detail in this report and the corresponding report by Shell (1977) and at the Public Inquiry included specific features of process design (to be at least as good as current codes of practice, though with additional safeguards in view of recent incidents--notably Qatar), site layout, possible interactions between each other's activities, bunding, construction, inspection and maintenance procedures, and high level of personnel training (being aware of the observation that 85% of industrial accidents appear to be due to human error). Distances between the proposed installations and nearby communities, when compared with similar plants elsewhere in the UK (Fawley--300 meters) or the world (Stenungsund, Sweden--750 meters, Cologne--900 meters), appeared favorable. Possible hazards that might arise in specified circumstances were considered, though a quantitative hazard assessment had not been attempted at the outline planning stage

because insufficient design detail was available. Moreover, Shell was said to have no support for quantitative risk analysis other than for sensitivity analysis. What had been attempted was to take some account of the consequences of certain events, and make an assessment, not necessarily quantitative, of the likelihood of these events occurring.

When compared to other activities' accident rates (industry, agriculture) the record of the petro-chemical industry was outstanding. The loading arm at Braefoot Bay was regarded as being the weakest link in a very strong chain. In general terms the fractionation and cracking processes to be undertaken at Mossmorran are ordinary. A number of relatively minor areas of uncertainty were admitted, but these were said to represent fine tuning rather than basic understanding of hazard properties.

4.2.4. Environment

Good environmental management is a policy of both companies, as may be seen from their facilities elsewhere. However, it was acknowledged at the Public Inquiry that if the development goes ahead, it will finish Braefoot Bay in its present form.

4.3. THE SCOTTISH DEVELOPMENT DEPARTMENT

Their statutory role in the decision process was to to advise the Secretary of State for Scotland on the decision he should make. This advice would be given in the light of all the available and relevant evidence. The Scottish Development Department commissioned a report on the visual impact of the proposed development, and made this available to parties. They also contributed to the cost of the Cremer and Warner report.

4.4. DEPARTMENTS OF ENERGY AND INDUSTRY

The summary of the national benefits given in Chapter 3 reflects the views of the Departments of Energy and Industry. It is relevant to add that although these Government departments thus endorsed the project, they had not endorsed the choice of the Mossmorran site, having offered no opinion either way during the decision process. Since the other dimensions are site specific there are no relevant official statements on them by this party.

4.5. THE LOCAL AUTHORITIES: FIFE, DUNFERMLINE AND KIRKCALDY

There is a good record of co-operation between Fife Region and its constituent District authorities and although planning committees and councils within each authority would necessarily have to ratify the proposals individually, the three authorities coordinated their consideration of the main elements of the proposals. It will be mainly a joint view that is summarized here. For the two district authorities, Dunfermline and Kirkcaldy, this was by far the largest planning application they had come across--a unique and interesting experience. Size itself was less unusual to the regional authority, but it was nevertheless an exceptional application.

In Section 2.4. the local authorities were introduced mainly in terms of their administrative roles; in this section their policy background is also of interest, notably that of achieving the objectives of sustaining satisfactory levels of employment opportunity and diversification of the industrial base of the Region (Fife Regional Report 1976--and since this is a statutory report, the objectives contained therein carry considerable weight). Mossmorran is one of only three industrial sites within Fife region which could accommodate industrial development on a significant scale. In terms of environmental policy, Mossmorran lies within an environmental improvement area, but environmental considerations are complementary to economic regeneration priorities. Braefoot Bay is included in a policy expressing the need to protect the coastline from sporadic and unregulated development. Environmental impact information is required in support of major planning applications.

4.5.1. National Benefits

The local authorities are not statutorally obliged to take account of national policy, unless specifically directed.

4.5.2. Local Socio-Economic Effects

As long as risk and environmental impact could be judged to be acceptable (this was considered to be so), there was little doubt that any major industrial development application for central Fife (given its poor economic base) would be supported by the local authorities.

The fact that there were three and not only one planning application for the Mossmorran site is significant here. The initial approach was by Shell to build an NGL plant. Esso were known to be looking for a site for an ethylene cracker (which in turn had the potential to attract downstream industry), and the oil companies were specifically asked by the local authorities to submit their applications so that they could be considered simultaneously by the local authorities. Thus Esso were asked to submit not only the ethylene cracker application along side Shell's, but also an application for downstream industrial development on the same site. The hierarchy of uncertainty over commitment to build these facilities noted in Chapter 2.1 was known to the local authorities. The last application was requested so that any potentially interested developers of

such industry need have no fears of administrative delay, as planning permission would be already granted. Had the application been for an NGL plant alone, individuals within the local authorities may have been less enthusiastic in their support.

The statement on employment potential summarized in Section 3 was based on the joint report (Fife 1977) prepared by the three Directors of Planning for the three councils, and thus reflects their overall view. Various individuals expressed different levels of enthusiasm about job prospects. Provost Wood, Chairman of Dunfermline District Council was confident on this count and considered that the developments would "smash the 26% unemployment rate in the Cowdenbeath area." Others were less positive: "The NGL plant alone would give a doubtful balance of advantage (of benefits against costs and uncertainties), the ethane cracker alongside only marginally better, but these are necessary gambles given the possible prize of downstream industry, and the last will certainly not materialize without the first two." There was no statement available from any individual (and none offered when asked specifically) about the degree of certainty with which downstream industry was anticipated.

The argument that operational phases of the NGL plant and ethylene cracker would poach key skilled personnel from existing industry, and thereby exert a negative employment effect found little sympathy within any of the local authorities: poaching, if it occurred, would be considered to stimulate new recruitment rather than industrial closure (another gamble here, but apparently born out in other areas of recent oil related development in Scotland); lack of poaching would indicate the arrival of well paid immigrants to the region. Either way regional wealth would increase.

In the construction phase the local authorities would ensure maximum local employment by requiring that subcontractors consult with them so that, where available, local skills would be used.

4.5.3. Health and Safety

Given the Peterhead "rehearsal," (see Appendix 1) the local authorities were aware in general terms from the start of the potentially hazardous nature of the developments sought at Mossmorran and Braefoot Bay. Their decision to appoint their own private consultants on hazard (Cremer and Warner) was to be an important one. This decision had been taken (via joint liaison between Fife, Kirkcaldy, and Dunfermline) in the informal consultation phase (mid-end 1976) so that when the application came in formally the necessary brief had been defined and Cremer and Warner could start work immediately.

Use of Cremer and Warner (at a cost of 45,000 pounds stg.) rather than the Health and Safety Executive (at no cost) deserves further elaboration; it was supported by the local authorities on several counts (different representatives mentioned different ones):

1. The resources of the Health and Safety Executive were considered to be too limited for advice at the planning stage (i.e., they were considered to concentrate their efforts on enforcement).
2. From other experiences the nature of the advice the Health and Safety Executive would offer was inflexible and did not match sufficiently closely the requirements of planners.
3. Paid advice from private consultants would match the terms of reference required by planners, and result in the type of report the latter would find most suitable.
4. An advisory role by the Health and Safety Executive in the planning process could conflict with their regulatory role of plant once built.
5. There may be conflict if the local authorities rely on the same advisory body (i.e., the Health and Safety Executive) as the Scottish Development Department and Secretary of State.

The Cremer and Warner report was written to a general brief asking advice as to the acceptability or unacceptability of applications (a) and (b) as regards hazard, including possible interaction effects and layout of elements in the proposed site, advice on the adequacy of information provided by the applicants and possible recommendations for planning conditions.

There was no statutory requirement that such a report should be prepared, but since hazard was a crucial element in the general cost-benefit balance of the applications at the local level, the local authorities sought outside expert advice on this aspect, according to the brief indicated above. A small contribution to the costs of the report was made by the Scottish Development Department, as its findings in relation to application (a) (an application of national significance) were of interest to this party.

The local authorities were fully satisfied with the Cremer and Warner report particularly in its suggestion of planning conditions and of a number of specific design details for the plant (insistence on fully redundant secondary containment; mounded storage; storage of propane and butane at Mossmorran rather than at Braefoot Bay). A much referred to statement from the report's conclusion was that:

> "...in the consultant's opinion, there is no reason to doubt that the installations proposed for Mossmorran and Braefoot Bay cannot be designed, built and operated in such a manner as to be acceptable in terms of environmental impact and community safety ... provided that relevant and adequate safeguards are agreed and ensured."

Faced with such a statement it is hardly surprising that the local authorities were less than convinced by contrary statements on safety being advanced by the local residents Action Group.

The Cremer and Warner report was the most detailed on hazard prepared for the Mossmorran-Braefoot Bay decision. It was not a comprehensive quantitative assessment, but an appraisal of various hazard characteristics of NGL plants and ethylene crackers of the general type that was to be built; there was some consultation with the oil companies over design details likely to be used which had not been specified in the planning applications. However, the lack of detail in the outline application was recognized to put a severe limitation on Cremer and Warner's assessment of hazards from the marine terminal at Braefoot Bay. Hazard probabilities were evaluated as small, remote, credible, etc., i.e., essentially non-quantitatively.

Although the Cremer and Warner report was the basis of the local authorities official view on hazard, not all hazard-related statements attributable to the authorities were founded in this report (this clearly could not be so before May 1977, and was not always so thereafter). The Cremer and Warner report had reassured them that an acceptably safe plant in principle could be built. A view was expressed that as long as the plant would be built and operated as safe as reasonably practicable under the Health and Safety at Work Act, given current design codes, and the specifications suggested by their consultants, (if necessary, planning conditions to the required effect would be stipulated--see section 5.6) risk would be acceptable. A statement to the Public Inquiry from one of the district councils summed up their position on hazard as follows:

> "The Kirkcaldy District Council must rest with the general conclusions of their consultants, Cremer and Warner, that at Mossmorran it is reasonably clear from the evidence that there is no reason to suppose that the plants cannot be designed within acceptable hazard limits and a full hazard and operability audit is required as part of the conditions for detailed approval."

Quantitative criteria were considered neither necessary (the non-quantitative criteria used would be quite adequate) nor suitable (the data was not reliable; the council would not know how to interpret results anyway), and had not been stipulated in the Cremer and Warner brief.

The local authorities were to make a further call on the advice of Cremer and Warner (1978a,b) in order to express an opinion on the radio-spark issue in the post-Inquiry period. Nothing arose in this respect that was considered to warrant any delay in official approval of the applications.

4.5.4. Environment

Monitoring and planning conditions would ensure acceptable environmental impact, although there would be a small but unavoidable amenity loss at Braefoot Bay.

4.6. THE FORTH PORTS AUTHORITY

The Forth Ports Authority's main involvement was to judge the suitability from a berthing and navigational point of view, of the Braefoot Bay site. They had had frequent meetings with the oil companies during 1976, studied various reports in relation to the Braefoot Bay site, and approved of its selection. Their early approval of the site had been a crucial factor. Following the selection of this site by the oil companies, the Forth Ports Authority had been asked by the Scottish Development Department to undertake an appraisal of 25 other potential marine sites on the Forth (Forth Ports Authority 1977). This was the most detailed consideration of alternative sites available during the decision process and deserves summary here, although it is restricted to a single aspect (shipping) and is an *ex post* validation of the choice of Braefoot Bay. Braefoot Bay was shown to be more suitable than any other (see Figure 4.1), lying east of the main Forth Bridges (thus avoiding additional piloting and navigational problems there), close to the main shipping channel, but screened from it (and also from adverse weather conditions) by Inchcolm Island, with land suitable for development on the adjacent shoreline. Of the other 25 sites considered, numbers 5, 6, and 7 would have been the next most suitable, but were nearer the bridges, and had executive housing on the adjacent shoreline. Of the sites west of the bridges, numbers 19-25 were the only serious contenders (others were unsuitable due to their proximity to naval explosive anchorages and activities at the naval dockyard at Rosyth), but had the disadvantage of requiring extra dredging of the channel for larger ships, which might upset the hydraulic nature of the river. Sites east of Braefoot Bay lacked shelter and would require impracticable harbor facilities.

A view expressed by the Forth Ports Authority on safety was that it was not something that happens on its own, but it is a subject that must be worked on. Their views on safety were not probed deeply at the Public Inquiry, but from subsequent communications it is clear that various codes of practice and guidelines existed, and others would be set up, to ensure safe handling of vessels. As mentioned above, recent legislation (the Forth Ports Authority Order Confirmation Act 1980) strengthens their arm in respect of scheduling shipping movements, designating routes and stipulating the condition of equipment. General directions will be issued nearer the time to ensure safe handling of Braefoot Bay vessels. The Authority are fully satisfied (and were at the time of the Mossmorran-Braefoot Bay decision) that they have sufficient power to ensure that gas tankers can be handled safely. Recognizing that absolute safety cannot be attained, various contingency emergency plans (fire fighting, evacuation) existed.

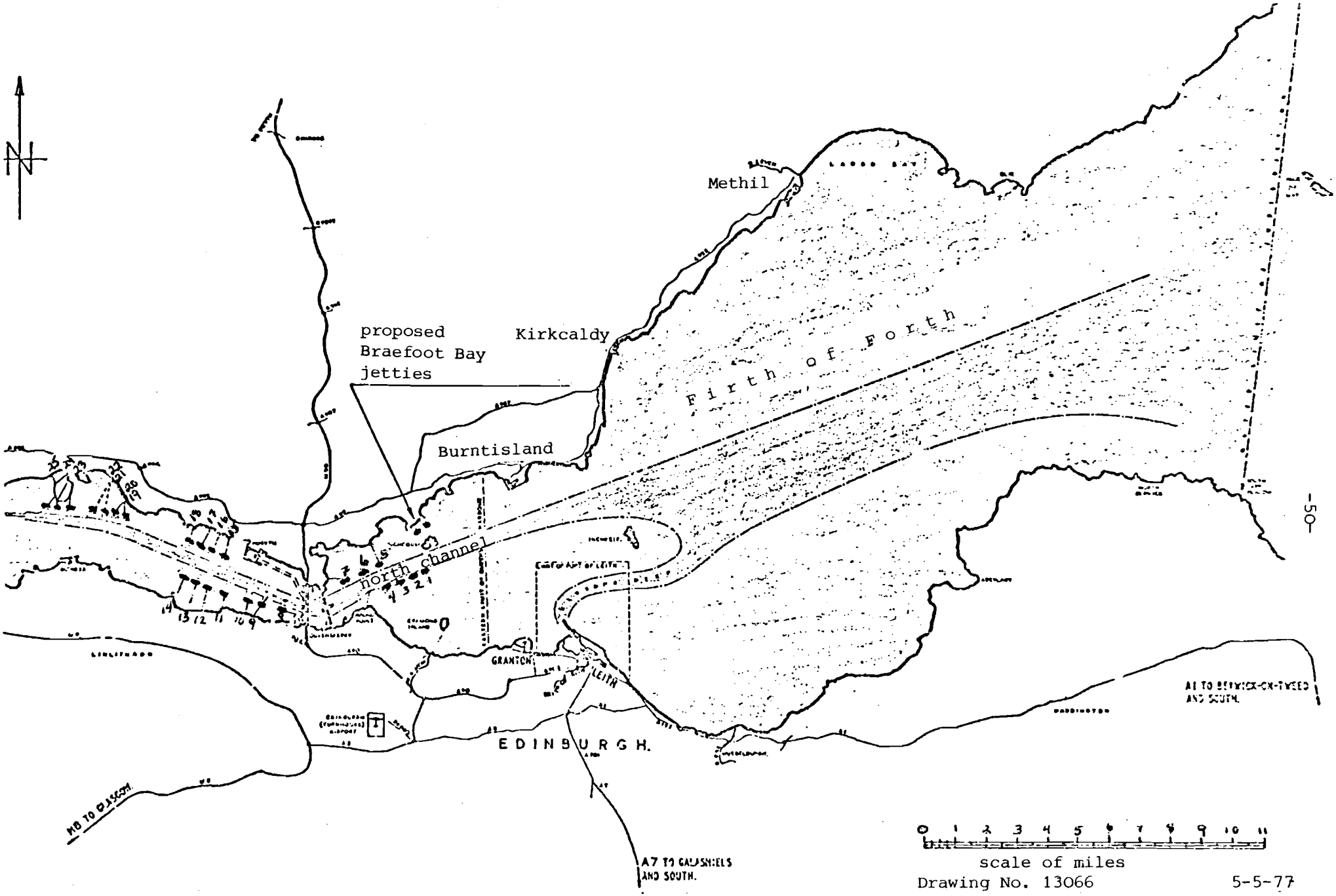


Figure 4.1. Forth Ports Authority: Forth Estuary--Investigation of Marine Terminal Sites Within Forth Estuary.

The safety criteria used by the Forth Ports Authority were qualitative and reflected in the above. They were not asked for quantitative assessment, and did not consider one required; their record to date on safety is good. Berthing occupancy forecasts for the Braefoot Bay jetties (16-20% Shell, 45-50% Esso) allow significant reserve capacity, and a build up of vessels during bad weather was not foreseen, partly because conditions prohibiting ship movements would not last more than twenty-four hours.

Although other parties (notably the Action Group) were to raise a residual concern over the Forth Ports Authority's regulation of naval vessels, the Authority were satisfied that they have the power to stop such traffic.

In order to contain potential environmental impacts of the Braefoot Bay activities, bunkering would be strictly controlled. Only liquid cargoes would be handled at the Braefoot Bay jetty. No undue interference with yachting was foreseen.

4.7. THE HEALTH AND SAFETY EXECUTIVE

The philosophy underpinning the Health and Safety Executive's statutory functions (and, by implication, the Health and Safety at Work Act) is that the prime responsibility for safety lies with industry (Robens 1972) and it would be inappropriate for such responsibility to be transferred to a regulating authority. Industry must demonstrate to the Executive that it has the necessary technical and management resources to ensure that an unacceptable level of risk will not arise. Risk acceptability could not be precisely defined, as it was recognized that there will always be a residual risk, so that judgments on risk acceptability in any particular case would be made in regard to the often extreme remoteness of the risk, the scale of disaster which could ensue and the cost of remedial measure i.e., judgments would take account of reasonableness and practicability. Quantitative criteria were not necessarily considered appropriate.

It is useful to distinguish the advisory role of the Health and Safety Executive during the decision process for a planning application, with their inspection and enforcement role for plant in operation or under construction. It is also important to recognize that their advisory role is not a fossilized one, but is evolving and adapting to changing circumstances; Mossmorran should not necessarily be considered representative of current practice (see section 7.7 for an indication of more recent practice).

Their advisory role in the Mossmorran-Braefoot Bay planning process was limited not only by a shortage of resources (thus they would not have had the manpower necessary to prepare an advisory report as extensive as that of Cremer and Warner's) but also (more importantly) due to their preference to reserve their substantial scrutiny of the safety of the proposed facilities until full design details were available. This point was particularly stressed in relation to application (c). The necessary information was not statutorally required during the decision process, (nor specifically requested by the Executive), and would not normally be

volunteered or even prepared by operators until they had been granted outline planning permission Thus, the Health and Safety Executive's role at the Public Inquiry was geared to making a judgment in principle as to whether the chosen type of installation when built on the chosen site, would be able to meet the Health and Safety at Work (etc.) Act and associated regulations. Their written judgment on safety submitted during the decision process must be seen in this light, and is reproduced in Appendix 4.

Both the Mossmorran and Braefoot Bay sites were considered in principle to be good sites (in terms of their geographical features) and it was concluded that if each plant is designed, constructed, installed, operated, and maintained to the highest standards currently available in the industry, no intolerable situation should be imposed within the site or in the surrounding neighborhood.

The Health and Safety Executive were to be involved in the decision process at various stages: they were notified by the local authorities of the planning application; they presented their view at the Public Inquiry (as noted immediately above); they were centrally involved in consideration of the radio sparks issue; and they advised the Secretary of State in relation to appropriate planning conditions. Their most important role, however, would arise in "unseen" consultations and maintaining of the detailed design and construction of the plant and with scrutiny of the safety audit that was to be stipulated as a planning condition.

Their published statements on radio sparks issued during the decision process were more exhaustive than those on all other safety factors. Two specific reports based on original field studies were issued in the course of their response to representations from the public (Health and Safety Executive 1978a,b). This apparently more thorough consideration should not be taken to reflect the considered relative importance of the issue, notably because:

(a) the design of the plant would have to be such as to ensure that the probability of significant escapes was remote;

(b) given an escape of gas a close ignition source (e.g., radio-spark) could prove fortunate;

(c) there are several other ignition sources (e.g., flare stack) in the vicinity anyway.

Other issues raised since the Inquiry were thought of rather greater importance, but statutory procedures prohibited open discussion of them (as they were not considered by the Secretary of State to be of a kind that had not been raised at the Inquiry), and they would in any case be fully assessed internally by the Health and Safety Executive before allowing the facilities to be commissioned.

4.8. THE ABERDOUR AND DALGETY BAY JOINT ACTION GROUP

This was the main party opposed in principle to the developments.

4.8.1. National Benefits

Of the four main dimensions, this was of least direct concern to the Action Group. The national benefits were not strongly disputed, although on one occasion at the Public Inquiry the point was made that, due to the 20% government development grant and tax concessions on capital allowances available to the oil companies, each permanent job at Mossmorran (from the NGL plant and ethylene cracker) could cost the nation 1 million pounds stg.; this seemed a ludicrously expensive job creation project!

4.8.2. Local Socio-Economic Benefits

There was a certain amount of scepticism expressed over the extent of local economic benefits from the plant. The Action Group emphasized that, of the three applications, the NGL plant was the only one with a firm commitment by the company. This plant alone would have doubtful economic benefit (as some local authorities had admitted--see section 4.5). They also noticed that statements issued from time to time by Esso that they expected to be able to give a firm decision on the ethylene cracker "within about eighteen months" or "in the first quarter of next year" remained unconfirmed until October 1980 (fourteen months after official planning approval had been granted). Without the cracker, there would be no downstream industries (the most (only?) significant local economic bonus of the development, as it alone would match the semi- and unskilled unemployed of Cowdenbeath). Moreover the Action Group's reading of the world's plastic industries indicated that since there was existing overcapacity, and new plants under construction worldwide, including the Middle East, industrialists would be unlikely to be attracted to Mossmorran anyway.

A further aspect on which the Action Group disputed the local economic benefits of the plant concerned the poaching of skilled labour from established industry in Fife. Higher salaries would attract key personnel, and a brake would be put on the expansion of existing industry; the result could be a net loss rather than a net increase in employment

Given these factors, the Action Group considered that the local authorities were being far too gullible over oil companies' assurances on plant benefits, and there was more of a gamble than was being admitted. More serious than any gamble on employment, however, was a gamble on safety.

4.8.3. Health and Safety

By far the main thrust of the Action Group's objections related to hazard. In their view the statutory authorities were not (could not be seen to be) giving a competent appraisal of safety. A list of points summarizing and reflecting the Action Group's own view is given here. The first point underpinned the Group's very existence.

1. The local authorities were not considered to be in a position to give an adequate appraisal of safety, because
   a) they were considered to lack the necessary internal technical skills;
   b) they could not be seen to be objective, given their initial immediate enthusiasm for industrial development at Mossmorran: moreover, consultants appointed by them could not be seen to be impartial;
   c) officials and councillors of the authorities had accused the Action Group of irresponsible scaremongering without (apparently) first attempting to appreciate the basis of the Group's fears; and
   d) there was a general lack of response to safety issues put to them by the Action Group.
2. Verbal reassurances on safety--of the type they were being offered by other parties--(whether offered by oil companies, Cremer and Warner, Local Authorities, Health and Safety Executive, or the Forth Ports Authority) were considered to be empty and meaningless given the tendency of "incredible" events (San Carlos, Qatar, Ab Qaiq, Das Island) and accidents (Flixborough, numerous oil/gas tanker incidents) to occur. Also, local residents considered themselves to have more to lose than any of these other parties, in the event of a disaster.
3. Current design codes/modern technology/good manning practices--apparently the cornerstones of the oil companies reassurances--were not found convincing--accidents happen in spite of them. Qatar had been a modern plant and the Action Group believed it to be a blueprint for Mossmorran (until its destruction in March 1977).
4. Physical separation was argued to be the only safeguard against accidents given the uncertain level of knowledge and technology and the magnitude of a potential disaster. Both Mossmorran and Braefoot Bay were said to be too close to neighboring communities (4 miles was considered to be an appropriate separation distance). Braefoot Bay (and associated marine activities) gave greater cause for concern because
   a) a severe accident there would directly affect Aberdour and Dalgety Bay, and possibly other communities, including Edinburgh,

b) it was regarded (by Cremer and Warner, and the oil companies) to be the weakest link,

c) it had been less thoroughly assessed than other components in the Cremer and Warner report,

d) they had been led to believe that evaporation rates and hence hazard potential posed by an unintentional release of gas over water were considerably greater than over land.

e) the extremely narrow and sharp approach to the jetty, coupled with hazardous rocks and tides was considered to make the navigation of the channel approach extremely dangerous,

f) the Health and Safety Executive had told the public inquiry that marine considerations (i.e., beyond the loading arm on the jetty) were not matters for their consideration.

5. It was considered that a full quantitative risk assessment could and should have been done before outline planning permission was granted. To grant permission in the absence of such an assessment was

a) to act (apparently) without any yardstick of risk acceptability given the considered inadequacy of purely verbal criteria,

b) to prevent open public scrutiny of any detailed assessment lacked both accountability to the population at most risk and, given their considered incompetence of statutory bodies, credibility. A suitable yardstick for risk acceptability would be 10^{-6}; however, it would need to be underpinned by an openly scrutinized quantitative risk assessment.

Some time after the close of the Inquiry, the Action Group issued their own partial quantitative assessment of risk. It was partial in the sense that only the Braefoot Bay terminal (not other marine activities or Mossmorran) was considered. It was based on the methods of the Canvey Report (Health and Safety Executive 1978) and the procedure used was verified by the firm of private consultants Burgoyne and Partners. Results are given in Tables 4.2 and 4.3. These are plainly at variance with the 10^{-6} "acceptable" standard agreed by other parties at the Inquiry. The Action Group concluded that other parties (who were not on the whole exposed to the risks) were quite happy to talk in terms of vague generalizations or even to accept that there is a certain minimum norm of public safety so long as there was no attempt to quantify the risk to see whether it satisfied the norm.

6. The Cremer and Warner report which had been the main basis for both the local authorities judgment on safety was considered to be deficient in a number of important respects.

7. There was considerable disquiet and resentment that the close of the Public Inquiry effectively meant the close of debate on safety, especially in view of the amount of additional "evidence" that was to emerge. None of the issues raised by the Action Group during the post-Inquiry period except that concerning radio sparks were given any response other than acknowledgement (including the report behind results in Table 4.2).

Table 4.2. Risk Assessment: Braefoot Bay Berthing Facilities

Location	Distance from Jetty (km)	Risk of Multiple Fatalities Per Year*
Aberdour	1	$1{,}000 \times 10^{-6}$
Dalgety Bay	1	$1{,}000 \times 10^{-6}$
N. Queensferry	5.6	11×10^{-6}
S. Queensferry	7.2	89×10^{-6}
Hound Point (Dalmeny)	4.5	13×10^{-6}
Cramond	6.1	37×10^{-6}
Granton	7.6	37×10^{-6}
Leith	9.8	19×10^{-6}
Burntisland	5.3	148×10^{-6}

*An acceptable level is generally agreed as being one in a million per year.

Source: Aberdour and Dalgety Bay Joint Action Group (1979); results verified in a private consultant's report.

Perhaps most important was the Action Group's appraisal of their statutory guardians of safety, the Health and Safety Executive.

a) their written evidence to the Public Inquiry was criticized for its superficiality (it is reproduced in Appendix 4);

b) their treatment of the radio sparks issue in the post-Inquiry period was considered inadequate (see section 5.5);

c) there appeared to be a number of inconsistencies in various Health and Safety Executive statements--a progressive disappearance of "one in a million" as an acceptable level of risk; the size of maximum credible spills at Canvey Island in relation to those at Braefoot Bay; an apparent change of policy by the Health and Safety Executive over the scrutiny of marine activities; the absence of a one mile "cordon sanitaire" at Braefoot Bay, but its advised implementation at Mossmorran.

Table 4.3.

1. Risk of major spillage at or near jetty due to fire/explosion = 8.4×10^{-4} pa

   (Chance of spillage/hazardous movement = 4×10^{-5} (Canvey)
   No. of laden movements = 210 pa (PI)
   Chance of non-ignition at source = 0.1 (Canvey))

2. Risk of major spillage at or near jetty due to collision = 10.5×10^{-4} pa

   (Chance of spillage/hazardous movement = 1.5×10^{-5} (Canvey)
   No. of laden movements = 210 pa (PI)
   Chance of non-ignition at source = 0.1 (Canvey))

3. Risk of major spillage at or near jetty due to escalation of minor spillage (ethylene only) = 7.5×10^{-4} pa

   (Chance of minor spillage/cargo transfer = 3×10^{-5} (Canvey)
   No. of movements pa = 150 (PI)
   Probability of escalation = 0.5 (Rasbank)
   Chance of non-ignition at source = 1/3 (Canvey))

Total chance of major spillage not ignited

$= (8.4 + 10.5 + 7.5) \times 10^{-4}$ pa

$= 26.4 \times 10^{-4}$ pa

Total chance of major spillage not ignited at source

$= 26.4 \times 10^{-4}$ pa

Wind factor, Dalgety Bay = 0.1

$\therefore$ chance of disaster at Dalgety Bay = 2.64×10^{-4}

Wind factor, Aberdour = 0.2

$\therefore$ chance of disaster at Aberdour = 5.28×10^{-4}

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Hazard source (4) - a spillage at jetty which is ignited there and is large enough to cause disaster at Dalgety Bay or Aberdour. Probability pa = 1.62×10^{-4}

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Overall results:

Probability of major disaster at Dalgety Bay = $2.64 + 1.62 = 4.3 \times 10^{-4}$ pa

Probability of major disaster at Aberdour = $5.28 + 1.62 = 6.9 \times 10^{-4}$ pa

d) the Health and Safety Executive were not considered to be independent of government; as civil servants it was considered that they would always avoid adopting positions at variance with Government policy; they were also suspicious of collusion between the Health and Safety Executive and industry.

e) the expertise of the Health and Safety Executive on certain technical maters appeared to the Action Group to be inferior to that of Rasbash their own technical expert, notably over the behavior of open flammable cloud explosions and the effectiveness (or otherwise) of the natural land contours around Braefoot Bay to shield Aberdour and Dalgety Bay in the event of an explosion at the jetty;

f) the safety standards to be adopted by the Health and Safety Executive did not look sufficiently stringent, in particular the lack of a cordon sanitaire at Braefoot Bay.

4.8.4. Environment

In the early stages of their campaign (up to and including the Public Inquiry) the Action Group vigorously opposed the applications on environmental and amenity grounds.

4.9. OTHER INDIVIDUALS AND ORGANIZATIONS

Not all opposition to the developments was articulated through the Action Group, and not all support for the developments was expressed directly by the parties whose viewpoints have been summarized above. It would be impossible to include all remaining viewpoints here--individual residents, students and professional academics, the Church of Scotland, newspaper editorials, and so on--but some will be mentioned.

4.9.1. The Population of Cowdenbeath

This was strongly in favor of the developments--a one time mining town, now severely run down following massive local pit closures and perceiving significant job opportunities from the gas plant developments to ease their chronic unemployment problems. Many were possibly oblivious to the technical hazard potential of liquefied gas, the employment benefits would more than compensate for others, and pride in a long mining history--with its associated dangers--made any risk from modern prestigious industry appear quite negligible.

4.9.2. The Population of Gray Park

Gray Park is a small council estate to the edge of the Mossmorran plant. They had been told initially that they were outside the danger zone, and were therefore quite happy to stay put. The Cremer and Warner report, advising evacuation, changed their views, but they would

be prepared to change again if experts could reassure them again that there was absolutely no danger. Their main concern was that they should remain as a community, re-housed *en bloc* should the need arise (see Appendix 2).

4.9.3. The Proprietor of St. Colme House

St. Colme House is a substantial dwelling lying within 540 meters of the proposed storage tanks at Braefoot Bay and with a direct view to the proposed jetty (consequently little shielding against an explosion there). The proprietor opposed the plant on grounds of environmental disturbance and hazard potential, but would have to settle for financial compensation from the companies to enable her to move from the property rather than convincing reassurances against possible fears.

4.9.4. The Conservation Society (Edinburgh Branch)

They opposed the planning applications on grounds which broadly coincided with those of the Action Group (with an additional plea for the conservation of North Sea resources), though the force and persistence of the latter's campaign on safety rather dwarfed that of the Conservation Society. As a local branch of a national environmental lobby their presence deserves noting as they were the only representatives of such a national lobby; the campaign of opposition was otherwise exclusively locally mounted.

4.9.5. Lothian Regional Council

Lothian Region lies to the south of the Forth Estuary, its northern boundary coinciding with the southern shoreline. Apparently to the indignation of their colleagues in Fife, Lothian Regional Council expressed concern over possible fire and explosion hazards from marine activities in the Forth Estuary that might affect their own region. Their representations met an administrative stone wall, however, as they had been raised in Spring 1979 at too late a stage in the decision process--spring 1977 during the statutory consultation phase was the time for objection.

4.9.6. Cramond Residents

Influenced by Action Group publicity, this residents association from the south of the Forth also voiced objection on grounds of hazard, but again at a relatively late stage in the decision process. Their view was communicated through their local Member of Parliament--one of the few M.P.'s who was to express scepticism over the developments--that the public inquiry had not made clear that a marine accident could easily cause casualties in North Edinburgh, and they therefore wanted an assurance that approval would only be granted if an accident that would cause death or serious injury *could not possibly happen*.

4.9.7. Political Viewpoints

Although not directly party to the decision process, the views of councillors and politicians as elected representatives of the population deserve comment. The main political parties--conservative, labour and liberal--supported the applications on principle, thus reflecting the majority view of their constituents (Aberdour and Dalgety Bay represent a relatively small fraction of the constituency). The (unelected) Scottish National Party candidates were more sceptical--both of employment prospects, reassurances on safety, accountability of the decision procedure, and justification of the final outcome--described by one SNP candidate (Scotsman letter, 15.8.79) as "cosmetic application of political whitewash."

There was no significant parliamentary discussion of the planning applications during the decision process, as this would have been improper. However, in a debate following the decision, a local labour party M.P. was to repeat a point he had made on earlier occasions, namely of the difficulties objector groups inherently face when mounting a campaign of opposition, irrespective of the merits of their case. Thus, the procedural grumbles of the Action Group were not without sympathy from elsewhere.

Although not a significant election issue at national government level, and the Action Group thus not politically aligned, the Action Group forced the planning applications to be an election issue at the local council elections by putting up their own candidate. It is reported that he failed to win a seat by just three votes. The significance of this is difficult to assess, for although it would appear that this candidate had some considerable support, characteristically low polls at local elections must also be recognized, thus a vigorous campaign on a single burning issue can capture a disproportionately large share of the total vote cast.

CHAPTER 5:
THE DECISION PROCEDURES INVOLVED

5.1. INTRODUCTION

The diary of events that became the decision process was regulated by what statutory procedures allowed and how individual parties chose to exert their allowable role. The aim of this chapter is to monitor the evolution of the decision process--divided into pre-, intra-, and post- Public Inquiry stages--against a background summary of statutory planning procedures in the UK.

5.2. A SUMMARY OF PLANNING PROCEDURES IN SCOTLAND*

Under the Town and Country Planning (Scotland) Act 1972, any development of land (with a few exceptions which have no bearing on the present case) requires planning permission. Thus any party wising to see a particular site developed, whether it be a householder intending to build a garage adjacent to his house, or a multi-national firm intending to develop a 700 acre site, must lodge a formal planning application, giving a written description of the intended development accompanied by outline plans, with the local district planning authority.

*Procedures in the rest of the UK are similar, but not identical, particularly in the position of the Region.

The lodging of a planning application initiates three lines of activity by the district planning authority: (1) notification; (2) publicity; (3) consultation. These three activities are represented on the left hand side of Figure 5.1 and will be discussed in turn.

5.2.1. Notification

District planning authorities are obliged to notify higher levels of government (regional or national) about applications which raise issues that may transcend the district level. At their discretion, these higher level authorities may "call in" the application and determine whether the application should be approved (i.e., outline planning permission should be granted, with or without conditions) or refused.

The majority of planning applications received by district authorities are determined at the district level, and raise issues that are confined essentially to the site in question. Applications which raise issues of more than district significance, specifically if they are contrary to or additional to the structure plan for the area, e.g., large industrial developments may be determined at the regional levels. Finally, the Secretary of State for Scotland may determine applications which raise issues of national significance (airports, power stations, large North Sea oil related developments).

Although it is thus possible to define three levels of development, those that qualify for district, regional and national determination respectively, it is not unusual for an application that qualifies for regional determination to be passed back to the district level for determination, or national back to regional. This is because in some cases district and regional, or district and national interests coincide, so that district determination is suitable. As already discussed (see section 2.3) the Mossmorran-Braefoot Bay planning applications were lodged at the district level (as are all planning applications) and determined at the national level.

For applications which are successful, planning permission is granted, possibly subject to a range of conditions, which may be quite extensive. In the case of the Shell-Esso proposals, the planning application was supported by documents outlining their visual appearance, infrastructural needs (water, drainage, road/rail access), economic and employment implications, and safety and pollution implications. It is suitable to include at this stage six general points about planning applications:

(1) Any development that is not covered in the original applications and supporting documents (e.g., an increase in plant capacity, a revised site lay-out) must be the subject of a separate planning application. Thus a proposal by Esso to re-locate the ethylene cracker within the Mossmorran site (March 1980) was the subject of a separate application.

(2) For large scale projects (such as Mossmorran-Braefoot Bay) the granting of planning permission involves a two stage procedure, the first stage of which culminates in the granting or refusing of *outline* planning permission (i.e., approval in principle). It is

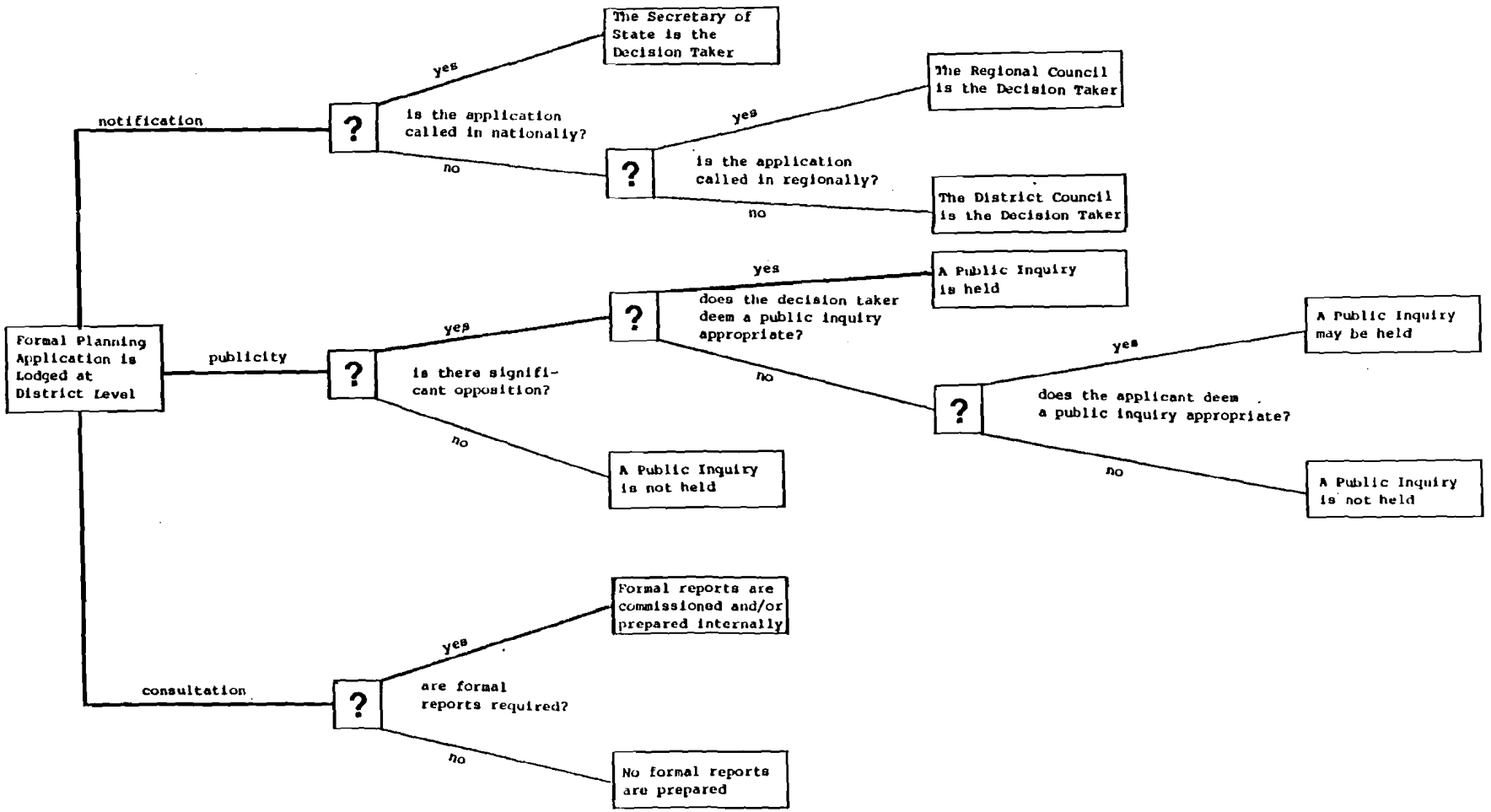


Figure 5.1. Possible Statutory Decision Procedures Following Receipt of Planning Application. (Bold lines indicate procedures relevant to the Mossmorran-Braefoot Bay Decision.)

this stage that, for the Mossmorran-Braefoot Bay developments, corresponds to the decision process described in this case study. Outline consent is followed in a second stage (not reviewed here) by detailed consent. Once outline approval has been granted, it can be removed on very limited grounds of specified reserved matters; otherwise the Government can face very substantial compensation claims. Thus outline permission is, for many purposes, regarded as full permission.

(3) The level of detail stipulated in the outline planning application in the two stage procedure has to be sufficient to establish the nature of activity proposed on the site, so that the determining authority can establish in principle whether the site is suitable for accommodating the proposal. Design detail of the plant and specific support services that will be required (so-called reserved maters) are usually not investigated until outline planning permission for the overall development has been granted. This order appears to meet both the interests of the developer and of the planning authority, as neither party will voluntarily undertake detailed investigations before approval in principle to the overall development has been given. Thus outline planning permission relates only to the principle use of the land, and not to any detail, even if this has been put in in support of the application.

(4) Planning permissions are granted for the development of specified activities on given sites and transfer of ownership of a particular site thus generally entails transfer of planning permission to the new owner. Thus Esso lodged application (c) (see Chapter 1) for downstream industrial development, in order to obtain industrial planning permission for the site rather than for itself as a company.

(5) Conditions may be attached to planning permissions in order to regulate the developments proposed (e.g., re-visual, and other environmental impacts, highways and access, plant capacity, and so on). Planning permission may lapse if development does not proceed within a given time period.

(6) Once an application has been called in by a higher level of government, the District Authority has no ultimate veto over the decision, and can therefore only present its case for or against the development alongside the cases of other parties to the decision.

5.2.2. Publicity

Under normal circumstances, if a decision is not made within two months of receipt of the planning application by the determining authority the applicant may appeal to the Secretary of State against deemed refusal and planning authorities aim to reach then decisions within this time limit. However, one of the statutory responsibilities of district planning authorities, on receipt of any contentious planning application, is to

publicize and advertise it to all parties which may be affected by it. This involves written correspondence with various organizations--neighboring councils, relevant government departments, local press advertisements, and local bill-posting. Projects for which significant interest and protest is thereby stimulated become candidates for a Public Inquiry--a forum in which arguments for and against the project can be presented in a manner in some ways similar to court proceedings (Town and Country Planning Act 1972, Scottish Development Department, 1975). The holding of a Public Inquiry can considerably protract the two month decision period indicated above. Proponents and opponents are able to put their own cases, and to cross-examine others, though all the evidence is supposed to relate specifically to the local planning issues involved; while national policy issues can be referred to, the merits of Government policy cannot be discussed.

There is no legal requirement that projects which are candidates for a Public Inquiry (e.g., arouse significant controversy) are in fact subject to such an Inquiry unless it is requested by the applicant or the planning authority. Thus it would have been legally possible (though, in view of the extent of objections raised, politically very difficult) to determine the Mossmorran-Braefoot Bay decision without a Public Inquiry. The decision taker, the statutory planning authority or the applicant are the only parties with a legal entitlement to force a Public Inquiry. Thus for applications for which significant controversy is aroused, the decision to hold a Public Inquiry is at the discretion of these parties, and not the objectors.

Statutory notice of four weeks must be given to all parties between the announcement that an Inquiry will be held and its commencement. Postponement may be granted at the discretion of the Inquiry Reporter. Parties are encouraged to circulate as much written information as possible in advance of the Inquiry in order to discourage "surprise" tactics. A memorandum of guidance was issued in 1975, and there are now inquiry rules. A pre-Inquiry meeting is often held in order to determine a suitable order of proceedings. The Inquiry hears the case of each party in turn (an alternative procedure, though one which is not adopted, would be to hear each issue in turn), with cross examination by other parties, or, more usually, their lawyers; the latter increase the formality and expense of participation.

The Inquiry is normally presided over by a Reporter from the Scottish Office Inquiry unit (assisted in this case by a technical assessor) who can put his own questions and cross-examine witnesses as he is responsible for reporting back and making recommendations to the "decision-taker" (the Secretary of State). He is also responsible for ensuring that all evidence is adequately examined and criticized.

Following the Inquiry (which may take a matter of days, weeks or months, with or without adjournments), the Reporter if so asked circulates his summary of proceedings to all parties involved so that they can comment on its accuracy, and then submits his summary along with his recommendations to the decision taker. Six months would be a reasonable time for this for a project of the scale of Mossmorran-Braefoot Bay. The decision is taken in the light of this report (the decision taker does not have to accept the Reporter's recommendations), or any national

policy issues and any new relevant evidence that may be brought to light after the close of the Inquiry which is of a kind that may have affected the Reporter's recommendations, had it arisen earlier. Such evidence must be notified to all parties who may submit written representations on it within 21 days. It is considered unnecessary for the decision taker to consider further representations on matters already aired at the Public Inquiry (whether or not made by parties present at the Inquiry). Thus the Public Inquiry is the only opportunity for open public debate and the pre-Inquiry period can be particularly intense, with extensive lobbying, canvassing, and case preparation. The decision taker may, at his discretion, reopen the Inquiry; the re-opened Inquiry would not necessarily be confined to any "new" issue, but could hear additional evidence on issues already previously treated.

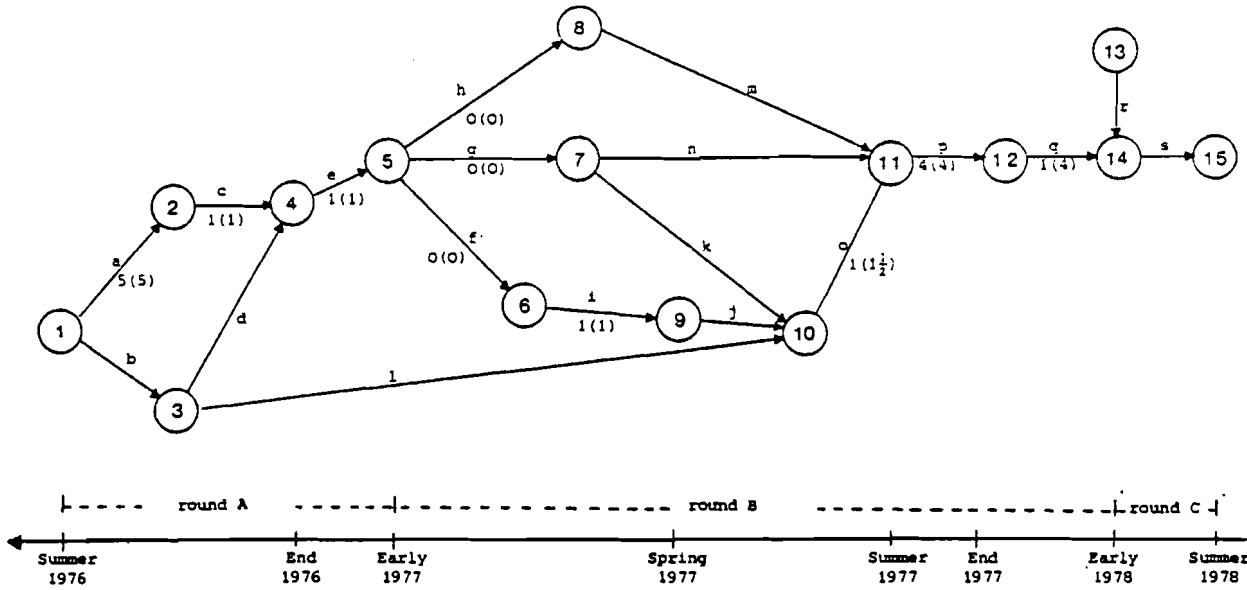
The decision taker would normally be expected to announce his decision within a few weeks (months in an involved case) of receiving the Inquiry Report. The report is published at the time of the decision.

5.2.3. Consultation

For large and complex planning applications, consultation with various external bodies (for example, concerning hazard and environmental impacts) and preparation of internal assessment reports (for example, concerning employment and social impacts) will generally be undertaken by district authorities before formulating their official view on the application. Detailed consultations as such will commence only after receipt of an official planning application. However, although not part of the statutory process, it is normal practice for projects of the size of Mossmorran-Braefoot Bay for developers and local authorities to discuss the proposals before the formal submission of a planning application. Such an exercise is directed initially at obtaining the basic information to enable the companies to decide whether the intended sites are suitable. At the same time it enables the planning authority to assess the nature of additional information that it will itself require in order to be able to judge the suitability of the application; for example, whether any specific reports need to be written or commissioned on particular aspects. Thus consultations undertaken during the pre-application period enable a more efficient processing of the formal application.

The above three activities--notification, publicity, and consultation--occur simultaneously, and in combination form the heart of the decision process. In the case of Mossmorran-Braefoot Bay, they combined as indicated in Figure 5.2 (a modified PERT diagram), where Node 5 represents the lodging of the official planning application. Subsequent sections of this chapter discuss the pre-, intra-, and post-inquiry stages in more detail, leading to the final decision of approval.

A further statutory requirement for the Mossmorran-Braefoot Bay developments was the granting of a jetty license by the Forth Ports Authority.



○ = Event (= completion of all activities leading to that node)

⟶ = Activity (= task required to be undertaken)

Numbers on edges indicate the time in months for the relevant activities:
The first number gives the expected/normal time
The number in parentheses gives the actual time for Moesmorran-Braefoot Bay

EVENTS

1. Oil companies show interest in Mossmorran-Braefoot Bay sites
2. Local authorities, Forth Ports Authority, and oil companies decide informally on suitability of site
3. Local opposition articulated
4. Public meetings are held
5. Formal planning applications are lodged
6. Regional/national levels are notified
7. Planning applications are publicized
8. Risk, environmental and economic impact analyses are commissioned/prepared
9. Applications are called in by Secretary of State
10. It is decided to hold a Public Inquiry
11. Public Inquiry is held
12. Public Inquiry report received by Secretary of State
13. Radio sparks issue is raised
14. Secretary of State announced provisional approval but asks for further submissions on radio sparks
15. Dialogue terminated; decision of approval announced

ACTIVITIES

a. Informal consultations between oil companies and local authorities
b. Consternation amongst local residents about the nature of the prepared plant
c. Public meetings are arranged by local authorities and oil companies
d. Local residents attend meetings
e. Oil companies prepare to lodge formal planning applications
f. Statutory notification set in train
g. Statutory publicity set in train
h. Consultations undertaken
i. Secretary of State reviews planning applications
j. Secretary of State awaits response to publicity
k. Significant opposition articulated following statutory publicity
l. Local residents further articulate their opposition
m. Local authorities unanimously approve of application and prepare case for public inquiry based on formal analyses and consultations
n. Interested parties prepare case for public inquiry
o. Statutory pre-inquiry activity coordinated by Inquiry Reporter
p. Inquiry report prepared and circulated for comment to parties present at the inquiry
q. Inquiry report is considered by Secretary of State alongside "national interest" and other issues
r. Radio sparks issue is brought to the attention of the Secretary of State
s. Interrupted dialogue between Health and Safety Executive and Action Group over radio sparks issue

Figure 5.2. PERT Diagram: Mossmorran-Braefoot Bay Decision

5.3. PRE-INQUIRY ACTIVITY

The period discussed in this section is that between August 1976 when the oil companies initially showed interest in the Mossmorran site, and May 1977, when the date of the Public Inquiry was officially announced (see decision diary, section 2.4). Formal planning applications were not lodged until January/February/March 1977, but there was a gradual sequence of both intra- and inter-party consultations throughout the pre-Inquiry period. The activities and consulations of the oil companies and local authorities will be summarized before describing the emergence of the objector groups.

Following the abandonment of the Peterhead Public Inquiry (see section 2.1 and Appendix 1), Shell undertook a search for possible alternative sites for a natural gas liquids plant. Options on land at Mossmorran-Braefoot Bay were negotiated at an early stage. It was rumored that the landowners, rather than the local authorities were the first to know of the oil companies interest early in July 1976. However, Shell soon engaged in consultations with the local authorities in order to satisfy themselves of the suitability of Mossmorran to accommodate a natural gas liquids plant. Esso was at the same time seeking a site for an ethylene cracker, and it was immediately evident that Mossmorran could potentially accommodate both types of plant.

The siting criteria for a NGL plant summarized by Shell at the Public Inquiry were:

> First, availability of an unrestricted deep water harbor within practicable pipelining distance of the extraction plant at St. Fergus; second, availability of a site for the fractionation plant sufficiently near the harbor to allow development that was safe and economic as well as suitable in terms of environmental impact; and third, the desirability of locating the plant within an area already proposed for industrial development by the local authorities. It was desirable but not essential that the site for the fractionation plant should also be suitable for an ethane cracker. It was also desirable for the site to be situated in proximity of a construction labour force.

Siting criteria indicated by Esso included safe and economic harbor facilities, and a location that could attract ethylene consuming industries; the latter criteria included both manpower and supporting services, and easy communication to markets in Europe and the UK.

The informal consultations between oil companies and local authorities in these early stages, coupled with information about the earlier Peterhead applications, gave a firm indication to the local authorities as to the nature of information they themselves would need to collect in order to be able to judge (i.e., support or oppose) the formal planning application. It was decided to appoint the private consultants Cremer and Warner to report on hazard and nuisance aspects, and for the authorities themselves to undertake a report on economic and environmental

impacts. The two resulting reports (Fife 1977; Cremer and Warner 1977) were the main written evidence that was used to justify the local authorities approval of the proposals in principle, and their suggestion of suitable planning conditions. An October 1976 entry in the decision diary indicates that the local authorities position in relation to the developments had been one of conditional approval from the start, although the depth of considerations that could underpin this approval was clearly to intensify as the decision procedure evolved.

As well as consulting with the local authorities at this time, the oil companies were also in consultation with the Forth Ports Authority as to the suitability of Braefoot Bay for the marine terminal. The early approval and cooperation given by the Forth Port Authority was an important factor.

Activities relevant to the eventual Mossmorran applications in the pre-Inquiry period were not confined to the Mossmorran site. Notably, there was some intra-party appraisal of possible alternative sites. It has proved difficult to get reliable information on this aspect, but alternative site possibilities included the following five categories:

1. In Spring 1977, the oil companies investigated other possible sites on the Forth Estuary. Braefoot Bay was considered to be the only suitable site for the marine terminal, Mossmorran was considered the best site for the process plant.
2. The oil companies earlier appraisal of alternative sites in summer 1976 is reported to have included possible sites on the Cromarty Firth (unavailability of construction workforce, unsuitability of harbor, distance from ethylene derivative markets made this location unsuitable), the Firth of Clyde (proximity of nuclear power station, distance for feedstock pipeline, and distance from ethylene derivative markets made this location unsuitable), and expansions of existing petro-chemical complexes (Grangemouth, Teeside). The influence of the Scottish National Party at the time may have been one of the considerations in choosing a site in Scotland.
3. The Scottish Development Department (1977) issued national planning guidelines which indicate the suitability of particular locations to accommodate large-scale industrial sites-- downstream petro-chemical development These may have aided the identification of contingency sites following the abandonment of Peterhead.
4. Various local authorities elsewhere in Scotland were apparently keen for Shell and Esso to show interest in their own region (including North-east Scotland, Banff and Buchan, Strathclyde). To this end they lobbied the Department of Energy to guide the companies in their direction, but without success.
5. At the request of the Scottish Development Department, the Forth Ports Authority undertook a study of 25 other possible marine sites on the Forth. Their report (see section 4.6) is overwhelmingly in favor of the site at Braefoot Bay. It is a post-hoc justification of the site (dated May 1977), and was not

available at the time the planning applications for Mossmorran-Braefoot Bay were lodged.

It was January/February/March 1977 before formal planning applications were lodged with the district authorities. It has been observed above (section 4.4) that the local authorities were keen for all three applications to be considered at once, as this changed the complexion of anticipated impacts. Processing of the applications by the district authorities involved the three separate lines of activity outlined in section 5.2.

(1) Statutory notification of the proposals to the Secretary of State for Scotland was followed by his "calling-in" of the applications (on 7th February 1977, 1st March 1977, and 5th April 1977 for the NGL plant, ethylene cracker and downstream industries respectively). The reasons given for the "call-in" were as follows:

> "The development proposals, which are closely connected with the supply of North Sea oil and gas, appear to raise major policy issues of more than district or regional significance, and to have implications for the national as well as the local economy. They are likely to have an impact extending beyond the immediate sites and localities and to raise general issues relating to the environment of the Forth Estuary."

Thus the Secretary of State, rather than district or regional councils, was to determine the applications.

(2) The planning applications were publicized, and generated over 400 objections, both by individuals and by organizations. Most of the objections received referred to more than one item of concern, and some were received by more than one local authority. Accurate analysis of the objections is difficult, but the main points raised are listed in Appendix 3 (after Fife 1977). Representatives of support were also received (in a petition of 87 signatories).

(3) The two written reports (Fife 1977, Cremer and Warner 1977) required to support the local authorities own appraisal of the proposals were formally commissioned. These reports were issued in May 1977 and made available for public inspection. The main conclusions of these reports have already been referred to (see Chapter 4.5) and entries in the decision diary (May 1977), reflect unanimous endorsement by the local authorities of the Shell/Esso proposals, subject to a number of planning conditions.

In view of the extensive objections lodged against the proposals (eventually over eight hundred) the Secretary of State considered it appropriate to hold a Public Inquiry; notice of this was given on 6th May 1977, and although originally to have opened on June 13th, was postponed for a fortnight at the request of the Action Group. The Regional and District Councils each submitted their own recommendations and comments to the Secretary of State and gave evidence to the Inquiry in support of the projects.

Paralleling the above levels of official activity was that of individuals and organizations opposed to the proposals. Local residents opposition was stimulated with the first rumors that Shell/Esso were interested in the Mossmorran-Braefoot Bay sites. The first concrete reflection of this can be found in local residents associations meetings in Aberdour and Dalgety Bay (October-November 1976), but there had been earlier indications in the press of the nature of the proposed activity, and the opposition it was likely to arouse.

According to press reports at the time, initial promotional meetings between oil companies, local authorities and the public (December 1976) appear to have done little to allay fears or reduce suspicions of some of the local residents. The latter were unconvinced by oil-company assurances on safety and environmental aspects, and suspicious that the local authorities were so enthusiastic about the employment prospects from the developments, that it would be impossible for them to make an objective assessment of safety factors. Moreover the appointment of the private firm, Cremer and Warner, as consultants on safety was little reassurance in this respect, as the mistrust of local authority figures by local opponents extended to a mistrust of any experts that these figures might themselves appoint.

The Joint Action Group was formed in February 1977 to coordinate local residents opposition. As already noted, this was to be the main opposition to the application. Various pamphlets publicizing their concern were issued, alongside extensive canvassing, exhibitions, and lobbying of officials; the latter activity found little sympathy.

The decision diary in Section 2.4 reflects events during this time. Activity during the first half of 1977 was directed towards presenting a convincing case of opposition at the Public Inquiry. Professor Rasbash at Edinburgh University had offered his services to the Action Group as their main expert witness on fire and explosion hazard. The activities of other individuals and organizations during the pre-Inquiry period are less well documented. The planning applications and issues they raised received steady coverage in the press (notably the Scotsman; also local newspapers)

5.4. THE PUBLIC INQUIRY

The terms of reference for the Public Inquiry were indicated in a letter from the Scottish Development Department dated 1 June 1977. This listed a number of general issues which the Secretary of State considered to be of major importance and which should therefore be "brought out" at the Inquiry.

(1) The safety of the proposed operations and plant at Mossmorran;

(2) The safety of the marine terminal, loading and shipping operations at Braefoot Bay, and of the linking pipelines to Mossmorran;

(3) the effect of the Braefoot Bay terminal on the environment, amenity, recreational activities, community development, and employment growth in the vicinity;

(4) The suitability or otherwise of other potential marine sites and means of providing loading facilities;

(5) the level of gaseous emissions in normal operation and any effects on human, animal and plant life;

(6) the probability of downstream development occurring at Mossmorran and the nature and expected effects on employment of such development;

(7) the extent to which any benefits of the proposals will offset any adverse environmental, economic, and social effects, having regard not only to the immediate vicinity but also to Fife Region and the Forth Estuary in general.

The above list was not intended to be exhaustive and it was recognized that there would be other issues which parties might wish to raise at the Inquiry. In effect, all but the merits of national policy could be debated; the place for the latter, though, was Parliament.

The Secretary of State also welcomed recommendations from the Inquiry of a kind which might be imposed as planning conditions.

It can be seen that the terms of reference for the Public Inquiry are loosely defined. The depth of consideration to be given to the various relevant aspects would depend on individual parties involved. There were no pre-defined yardsticks for assessing any of the dimensions. Party activities in turn would be constrained by information available to them before the Inquiry; their own level of expertise; time available to digest this information; digestion of arguments at the Inquiry; directions by the Reporter. The Public Inquiry is something of an adversarial encounter between proposers and opponents to a planning application. The Inquiry Reporter's recommendations are based on his evaluation of the resulting exchanges.

A pre-Inquiry meeting was held (June 1977) in order to establish a batting order so that parties would know on which days they would be required, to circulate available representations and ask for others to be made available, and acquaint parties with the procedures to be adopted.

The Inquiry sat on eighteen days, between the 27th June and 21st July 1977. The Inquiry Reporter was Mr. A.G. Bell, Deputy Chief Reporter, Scotland. The parties represented were:

For the proposals:

Shell
Esso
Fife Regional Council
Dunfermline District Council
Kirkcaldy District Council

Against the proposals:

Aberdour and Dalgety Bay Joint Action Group
Donibristle Investments Ltd (Developers of Dalgety Bay New Town)
Gray Park Tenants Association
The Conservation Society
Various Yachting Interests
About forty individuals

"Independents"*

The Health and Safety Executive
Cremer and Warner
The Forth Ports Authority
Representatives of local political parties

The views expressed by the main parties involved are reflected in Chapter 4.

Written reports on safety available at the Public Inquiry were as follows:

1. Shell: Environmental and Hazard Survey Report, NGL plant
2. Esso: Environmental and Hazard Survey Report, ethylene cracker
3. Aberdour and Dalgety Bay Joint Action Group: Preliminary technical report.
4. Conservation Society: Report on safety and environmental aspects by John Busby.
5. Health and Safety Executive: Statements of evidence by Messrs Offord and Foster (see Appendix 4).
6. Cremer and Warner: Hazard and Environmental Impact Report.
7. Rasbash: Written statement of evidence.

Of these, the Cremer and Warner Report was the most extensive.

The Reporter appears to have had little hesitation in recommending that outline planning permission for the proposed developments should be granted (see Appendix 5 for his conclusions). A number of planning conditions had been suggested by the local authorities and these in general were later to be reflected among the statutory planning conditions which accompanied the Secretary of State's decision of approval.

*Independent in the sense that these parties were not advocating the proposals, although none spoke against them.

5.5. POST-INQUIRY ACTIVITY

Activity following the Inquiry looked set to follow the normal course of events (the Reporter summarized the proceedings and submitted his recommendations to the Secretary of State in November 1977), until December 1977, roughly at the time when the decision had been expected, the Action Group publicly raised the issue of possible ignition hazards due to break sparks from radio transmissions. (The issue had apparently already been raised by the Scottish Development Department and Ministry of Defence in a different content, as these bodies were studying a similar issue which had arisen at a defense establishment elsewhere--Cramond, near St. Fergus). As this was an issue that had not been touched on at the Inquiry, the Secretary of State deemed it appropriate to invite for his consideration any representations which any of the parties might wish to submit to him on the matter. The Action Group's initial representation on radio-sparks along with a letter in response from the Health and Safety Executive were accordingly circulated to all parties on 29th March 1978 inviting their comments within a period of 28 days. This was to be the first of five rounds of correspondence on this issue, with a further sixteen months or so before the final decision was announced. This is a remarkably long time when one recalls the stated urgency of an early decision. These rounds are listed in the decision diary (section 2.4).

Although a number of other representations unconnected with radio-sparks were received by the Secretary of State, none was considered to raise significant new issues of a kind which had not already been discussed at the Public Inquiry and therefore required (and were given) no response other than acknowledgement. Thus the provisional decision of approval announced on 29th March 1978 was provisional only on the issue of radio-sparks.

Much of the correspondence of this post-Inquiry period has been made available by the Scottish Development Department, and this has contributed to the picture that emerges of the positions of the main parties at this time.

The local authorities' made representations on radio-sparks based on further reports commissioned by them on this aspect from Cremer and Warner (1978a,b). There was no substantial change in their earlier position, and they expressed their eagerness for the Secretary of State to verify formally his provisional decision of approval.

The Health and Safety Executive's response was based on their monitoring of field experiments--apparently undertaken by Shell--and included further written reports (1978a,b), and it was the undertaking of these that was the most time-consuming aspect of post-Inquiry activity.

Other individuals and organizations, faced with the opportunity of correspondence with the Secretary of State, augmented any comments they may have had on radio sparks with others on different aspects of the development and of the decision process; most prominent here were repeated calls from the Action Group, and sympathizers, for the Inquiry to be re-opened. Press reports monitored the exchanges from a distance, garnished with rumors that the oil companies would pull out if the delay

continued much longer--certainly the hope of the Action Group, but nowhere substantiated.

The main evident post-Inquiry interaction was in the form of an interrupted dialogue, coordinated through the Scottish Development Department between the Action Group and the Health and Safety Executive. Dissatisfaction on the part of the objectors with successive responses from the Health and Safety Executive generated further rounds of correspondence. The process was terminated rather than resolved with the Secretary of State's decision in August 1979. A number of interesting aspects emerge from this period.

1. The fact that the question of radio-sparks emerged within six months of what was supposed to have been an exhaustive inquiry based on supposedly thorough technical assessments was taken by the Action Group as an illustration of
   (a) a general lack of knowledge of the extent of the hazard posed by the planned facilities;
   (b) the view that little (no) confidence could be placed in the judgment of so-called experts.
2. That more than one round of correspondence between themselves and the Health and Safety Executive ensued generated accusations from the Action Group that the Executive were being "slipshod and incompetent in carrying out the procedural parts of their studies and untrustworthy in interpreting the results" (Sutcliffe 1979). This reinforced the Action Group's earlier view that no confidence could be placed in any of the Health and Safety Executive's advice, and decisions based on it would be likely to be faulty in respect of safety. A different view would be that the Health and Safety Executive were simply setting out to provide a considered response to every communication passed on by the Secretary of State. The Action Group (and their immediate sympathizers) were alone in their lack of confidence in the Health and Safety Executive.
3. The fact that so much attention was given to the radio-sparks issue gives a striking imbalance to the range and depth of safety considerations. This is all the more surprising when it is realized that *all* parties (both proposers and objectors) considered the issue, in itself, a relatively insignificant one.
4. A re-opening of the Inquiry, to enable a more direct dialogue between parties on the issue of radio-sparks, was officially said to have been inappropriate on two main counts. Firstly that this would have had no effect on the necessary field experiments which were the most time consuming aspect of the post-Inquiry activities. Secondly, that a re-opened Inquiry would enable aspects other than radio-sparks to have been brought out, and the Secretary of State had already decided that these had been sufficiently aired at the original Inquiry. Thus the Secretary of State considered that the sparks issue could most appropriately be handled through written correspondence.

There were repeated calls from objectors for the Inquiry to be re-opened, and the objectors considered it "unorthodox" that this had not in fact happened (see below). There was a considerable amount of strained correspondence between the Action Group and the Scottish Development Department--alternately punctilious and desultory. There appears in particular to have been some difficulty over the Action Group being denied access to certain relevant documents (notably the Excell report--see diary above, June 1978) and in an unreasonably short time being given for their comments (weeks for the Action Group, months for the Health and Safety Executive). In two cases successful appeals to court were made or threatened against the Scottish Development Department to clear up these matters.

The delay served its own function for the Action Group. It saw

(1) increased support for its cause--from academics, (including Professor Fay of MIT, a "known" figure in this field) Lothian Regional Council, and resident associations South of the Forth, and media coverage (numerous newspaper articles and three television programs which generally favored the objectors rather than the proposers standpoint--see Table 5.1);

Table 5.1. Reports on radio sparks.

New Scientist (1978) Excell (1978)	Not specific to Mossmorran
Cremer and Warner (1978a,b) Health and Safety Executive (1978a)	
Sutcliffe (1980)	
Also, letters and technical notes written by the Action Group and the Health and Safety Executive at various times.	

(2) a mass of what the Action Group considered to be "additional evidence" (see Table 5.2) notably their preparation of a partial quantitative risk assessment and its methodological verification by Burgoyne's (a firm of private consultants);

(3) the continued hope that their cause was not lost as long as the decision had not been taken.

This hope was lifted when the conservative general election victory in May 1979 saw George Younger succeed Bruce Millan as Secretary of State for Scotland, with the promise that he would review the Action Group's additional evidence before announcing his decision. A visit by Action Group representatives to the national parliament in Westminster was also made. The sympathetic hearing they received was little comfort for the final

Table 5.2. Items of "Additional" evidence raised by the Action Group.

Notable reports issued since the Public Inquiry	Major' 1.e.g. incidents
Health and Safety Executive 1978b (Canvey)	San Carlos
General Accounting Office 1978	Ab Qaig
Aberdour and Dalgety Bay Joint Action Group 1979	Qatar
Gugan 1979	Das Island

decision of approval to Shell and Esso's planning application that was given in August 1979.

The role the post-Inquiry delay served for other parties is reviewed in Chapter 6.3.

5.6. THE DECISION OUTCOME AND ITS OFFICIAL JUSTIFICATION

The following extract is taken from the letter giving the Secretary of State's decision of approval issued on 9th August 1979.

1. The Secretary of State has had no difficulty in accepting that, from the land use point of view, the Mossmorran site is suitable for the developments proposed there. On the other hand he agrees that the site proposed for the related marine terminal at Braefoot Bay would not normally be regarded as an appropriate location for such development in view of the adverse effects on the environment and the area's recreational value. Only an overriding case of need in the national economic interest could justify permitting a marine terminal at Braefoot Bay in face of the amenity objections, even though detailed planning conditions in relation to development there would reduce the adverse environmental effects. The evidence and the Reporter's conclusions have therefore been assessed very carefully in order to determine whether such need for this particular site sufficiently outweighs these objections. No convincing evidence has emerged to support an assumption that a better site for a marine terminal could be found which would adequately serve the needs of the proposed NGL plant. The Mossmorran site is an

acceptable location for the building of an NGL plant and no more suitable site has been shown to exist for an associated marine terminal. The Secretary of State therefore feels bound to conclude that the demonstrated need for the marine terminal development at Braefoot Bay decisively outweighs the amenity objections. In reaching this conclusion the Secretary of State has had regad to the need, in the national interest to make provision for NGL separation plant facilities to take advantage of, and avoid wasting, the very large gas resources of the Brent field. Having accepted that there is justification for allowing terminal facilities for the NGL plant at Braefoot Bay, the Secretary of State considers it right to permit there also the provision of terminal facilities for the ethylene product of the proposed ethane cracker at Mossmorran since there are decided economic advantages in having an NGL separation plant and a cracker located in proximity to one another, and use of the Braefoot Bay site makes this possible.

2. The most contentious issue raised in the evidence has undoubtedly been the question of hazard arising from a possible major spill of product at Mossmorran, Braefoot Bay or from one of the connecting pipelines. Unlike the amenity objections discussed above, there can be no question of economic need for the developments being balanced against this factor: considerations of public safety would automatically rule out the developments if it were shown that they would give rise to an unacceptable level of hazard.

3. The Secretary of State is satisfied that the plants can be designed to operate within an acceptable level of hazard. He has arrived at this decision on the basis of the report of the Public Inquiry and consideration of all the representations received following it does not lead him to depart from that. As far as technology is concerned, there is nothing novel involved in the processes to be carried out. The Secretary of State considers that full allowance can be made for the hazardous nature of the products involved by appropriate design of the installations at Mossmorran and Braefoot Bay. In reaching this decision the Secretary of State has noted the difference of opinion that was voiced at the Public Inquiry and in the representations after it about the safety standards which should be applied to a development of this kind and has given careful consideration to them. He has noted however that Health and Safety Executive have advised, the most recent occasion being 6 March 1979, that on the information available to them they believe that the proposed developments can be constructed and operated so as to comply with current health and safety legislation. If the Health and Safety Executive assessment of the detailed design shows that the proposed development does not meet the required standard then powers are available to them under the Health and Safety a Work Act to take appropriate action. The Health and Safety Executive will be involved throughout the planning and commissioning of the plant and have the power under the Health and Safety

at Work Act to issue an improvement or prohibition notice where there is observed or anticipated at contravention of the relevant safety provisions. Should a doubt as to the safety of the plant emerge at any stage of its design or operation the Health and Safety Executive, whose view of the importance of safety is shared by the Secretary of State, would not hesitate to use their powers. As mentioned in paragraph 11 above the Secretary of State has now imposed a condition under which he must also be satisfied that a full independent hazard audit has been carried out and, in the light of it and of the safety level revealed by the detailed study of the plant's design, that the plant and the terminal can be operated at an acceptable level of safety. The Secretary of State considers that with such a strong and continuing statutory safeguard in existence together with the requirement for a full hazard audit to his satisfaction there should be no question of a unacceptable risk emerging as a result of the development. Until there is a detailed design, the question of safety of the plant cannot finally be determined.

4. The Reporter recommended that as an additional safeguard the ethylene storage tanks at Braefoot Bay (like the NGL storage tanks at Mossmorran) should incorporate fully redundant secondary containment--that is double containment tanks the outer wall of which is capable of withstanding the rupture of the inner wall. The Secretary of State accepts that this should be made a condition of planning permission.

5. The Secretary of State accepts the final advise of Health and Safety Executive on the question of radio transmissions. This was given 6 March 1979 and stated that the further work which had been carried out by them reinforced their earlier view that the possibility of radio frequency sparks is low and the probability of such sparks igniting concentrations of flammable substances which happen to have spilled at the sites is even lower. Provided that the recommendations outlined in the Health and Safety Executive report of July 1978 were fully implemented the radio frequency hazard would in the view of Health and Safety Executive be insignificant. They therefore saw no reason on the grounds of hazards from radio transmissions why the proposed development at Braefoot Bay and Mossmorran should not be permitted. In deciding to accept this view the Secretary of State has taken account of the representations received subsequent to 12 March 1979, when the Secretary of State circulated further material to parties. None of the representations received on the questions of radio transmissions since the closing of the inquiry therefore leads the Secretary of State to depart from the conclusion that planning permission should be granted.

In addition to the above justification for the decision of approval, forty-eight planning conditions were stipulated for the natural gas liquids plant (application (a), chapter 1); an almost identical set of conditions was stipulated for the ethylene cracker (application (b)). These were, of

course, additional to the terms of any other approvals received under other statutes and included general conditions on plant size (a maximum nominal annual intake capacity of 2.14 million tons for the natural gas liquids plant, and a maximum nominal capacity of 0.6 million for the ethylene cracker), restricted use of the Braefoot Bay jetty for piped products, provision of a master plan and expected construction time, and provisions for temporary site works. Also included were conditions on highways and access; visual impact; infrastructure; water, air and noise pollution; and seven hazard/safety conditions, which are repeated here in full.

1. A full independent hazard and operability audit in relation to the design and construction of the NGL feedline within the site, NGL plant, product pipelines and terminal facilities shall be carried out to the satisfaction of the Secretary of State prior to the commissioning of the plant. Operation of the facilities shall not begin until any requirements of the Secretary of State in the light of this audit have been complied with.
2. The fire fighting facilities at Mossmorran shall be designed, instabled and maintained to the satisfaction of the planning authority in consultation with the Firemaster and the Health and Safety Executive.
3. Operation of the Mossmorran and Braefoot Bay facilities shall not be commenced until such time as any measures considered necessary by the Secretary of State have been carried out to deal with any possible hazard effects of radio transmissions on the facilities. In particular comprehensive tests to determine electro-magnetic field strengths and levels of power induced in site structures shall be conducted on the proposed plant during its construction, to the satisfaction of the Secretary of State. Where such tests confirm the need, safeguards and monitoring devices shall be installed to the satisfaction of the Secretary of State on any of the plants where this is found or thought to be necessary.
4. Arrangements at the Braefoot Bay terminal for the pumping of water for fire fighting shall be designed and installed to the satisfaction of the planning authority in consultation with the Firemaster, the Forth Ports Authority, and the Health and Safety Executive.
5. Adequate manning procedures and equipment to the satisfaction of the planning authority in consultation with the Forth Ports Authority and the Health and Safety Executive shall be used at all times during the loading of liquid petroleum gas and natural gasoline tankers at Braefoot Bay.
6. Access to the Braefoot Bay terminal and jetties shall be restricted to authorized personnel only.
7. The venting of propane or butane to the atmosphere from ship's tanks shall not be permitted at the Braefoot Bay terminal except in emergency circumstances.

In an effort to expose what in their view was the injustice of this decision, in October 1979 the Action Group lodged a court appeal against the Secretary of State's decision on procedural grounds (to the effect that the Secretary of State failed to exercise proper judgement in the way aspects of safety could be considered on a planning application). The Court was forthright in its rejection of this appeal.

CHAPTER 6:
PARTY PERSPECTIVES ON ELEMENTS OF THE DECISION PROCEDURE

6.1. INTRODUCTION

Although it is possible to infer from previous chapters various party perspectives on different aspects of the decision procedure, it is the intention in this chapter to review procedural aspects more comprehensively.

6.2. TIMING AND DYNAMICS

The decision diary (section 2.4) reflects the actual sequence of events to emerge, and although moulded in general terms by the Town and Country Planning (Scotland) Act 1972, this Act leaves a certain amount of leeway as to what could have evolved. It is therefore useful to consider how party roles and hence decision dynamics, may have been influenced not only by statutory planning procedures, but also by parties' own internal policies and options; external constraints in terms of time and resources (money and expertise); the roles other parties were playing.

1. The depth to which various issues could be debated at any stage during the decision process was dictated to a large extent by the level of detail of plant design released by the oil companies. Thus the Cremer and Warner report related to a generic natural gas liquid plant and generic ethylene cracker rather than the specific plant/cracker that would necessarily be built at

Mossmorran. Although Shell's plans were relatively advanced, little specific design detail about the cracker had been released at the time the report was prepared. "Esso's plans are in a state of flux and few, if any, details are finalized" (Cremer and Warner 1977). Moreover, planning procedures do not require specific plant design details to be known in order for outline planning permission to be granted (unless a statutory authority specifically calls for such details), as the question at issue is whether the process or activity is suitable in principle for the site chosen. This suits the developers who are said to require guaranteed planning permission before investigating final design details and giving definite commitment to building the plant (it was late 1980 before Esso were firmly committed to the ethylene cracker) and appeared to be satisfactory to the local authorities. There are said to be many pitfalls in having too much detail at too early a stage; notably that it may result in plans being frozen to a less than optimal design. On the other hand it could be argued that amendments to an initial design could be submitted as and when necessary.

The level of detail available severely limited the contribution of both the Health and Safety Executive and the Action Group. The former were unwilling to comment in detail on generic plants; their detailed scrutiny of plant safety would only be carried out specifically in relation to the actual plant and they accordingly made a particularly modest contribution at the Public Inquiry--to the dismay and derision of the objectors. The Executive could have reserved their judgment until greater detail became available (i.e., requested that adequate detail became available within a given time, period as has more recently been done) but did not consider it necessary to do so, given the fact that they were to monitor the release of reserved matters, and given the forthcoming safety audit in the planning conditions.

The Action Group's self-chosen purpose of attempting to increase the depth to which safety considerations would be openly debated in the planning process was accordingly severely frustrated by the level of design detail required. In particular, their call for a quantitative risk assessment at the Public Inquiry was said to be impossible to answer.

2. Since the Public Inquiry would be the only occasion for open interparty involvement in the decision process, it was vital that all aspects about which parties wished to present a case were brought out to the required depth. The required statutory minimum notice for a Public Inquiry is four weeks. The Action Group considered that this immediately put them at a disadvantage. Of all the main parties, they alone would be working during "spare" time (for others it would be another aspect of their paid employment), both to prepare their cases, (4/5 weeks was considered an unreasonably short time) and to attend the Inquiry (with a potential loss of earnings over the Inquiry period). At their request, a postponement of two weeks was granted in order to allow more time for their case to be

prepared including their assimilation of the Cremer and Warner report: a further postponement, though requested, was not granted (such postponements are granted at the discretion of the Reporter).

During the Inquiry proceedings time again exerted an influence in constraining the contribution of parties, notably in terms of adequately digesting arguments of others. Again the Action Group would claim their disadvantage in this respect to be greater than that of their more experienced opponents.

The Action Group were not alone in considering time constraints inhibiting. The Health and Safety Executive remarked that they had also only had the statutory time limit in which to assemble their case. The objections of Lothian Regional Council (see Section 4.9) were also beaten by time.

3. Additional evidence that may come to light after the Inquiry need not be considered as relevant by the decision taker. Moreover, it would have been improper for other parties (particularly statutory authorities), even if they had wanted to, to openly debate such evidence as may have arisen. There is undoubtedly some ambiguity as to what is and what is not "relevant" or "additional" and it is for the decision taking authority to decide. The radio sparks issue was considered relevant. Other evidence submitted by the Action Group (see Section 5.5) was considered by the Secretary of State to be of a kind that already had been covered at the Inquiry. The irony is that the radio sparks issue (which was considered at length) was considered by other main parties, notably the Health and Safety Executive, to be significantly less important than other evidence (which was not) raised following the Inquiry. This aspect further fueled the frustration and disquiet of the Action Group. The following aspects highlighted the Group's concern.

   (a) During consideration of the radio-sparks issue (a dialogue essentially between the Action Group and the Health and Safety Executive) the Action Group were given weeks and the Health and Safety Executive months to respond in successive rounds of correspondence. This was considered both unreasonable and impractical.

   (b) The Shipping Hazards report prepared by the Action Group could not have been submitted to the Inquiry as the Canvey report on which it was based had not been released by then. Their calculations of a 10^{-3} risk to the Aberdour and Dalgety Bay communities (see Table 4.2) is plainly at variance with the "accepted" 10^{-6} risk level agreed by other parties at the Public Inquiry, yet there was no machinery whereby official response and open dialogue about this could take place (as it was not judged by the Secretary of State to be new information relevant to the decision).

The Action Group's protests were directed to different statutory authorities at different stages in the decision process: initially until January 1977, to the local authorities; subsequently (following the "call-in"), to the Scottish Development Department; later (the Public Inquiry onwards) to the Health and Safety Executive.

Again, the Action Group were not alone in complaining of post-Inquiry timing of events. The oil companies made the point that although all parties to the decision had a strictly limited time in which to respond to given aspects, or make representations on others, the Secretary of State could (and apparently did) give himself unlimited time.

6.3. THE DELAY

For a project of this scale, six months would be a reasonable time lag between Public Inquiry and decision (though much would depend upon the length of time needed to prepare the Inquiry report). The time lag in fact turned out to be over two years. At the Public Inquiry, time was said to be important by both Shell and Esso. Shell in particular were said to have a contract to deliver gas to the British Gas Corporation by October 1980 at the latest, and to deliver propane and butane to Northern Liquid Fuels (North America) by 1981. Moreover, the official government policy statement (see section 3.2) noted the importance of an early decision and the need to have the plants built and commissioned by 1980. A decision had been expected by December 1977. The activities of the two main parties involved in the delay have been reviewed above. In this section, party perspectives on some strategic aspects of the delay and its associated uncertainty are summarized.

(1) It was almost inevitable that rumors that the oil companies might abandon their plans for Mossmorran-Braefoot Bay would arise during the delay. No substance appears to have emerged to support press rumors or the Action Group's ultimate hope on this count. The local authorities and Scottish Development Department appeared unperturbed, as it was their firm belief that Mossmorran-Braefoot Bay was the most (only?) suitable site for the proposed developments and the costs to the companies of starting afresh elsewhere were considered less attractive than the option of awaiting a final decision.

(2) From the perspective of national government, the uncertainty generated by the delay could have been significant. As remarked above, a delay such as was seen will have done little to improve the UK's reputation for encouraging the establishment of petro-chemical industry based on North Sea resources.

(3) It has been indicated that potential downstream industrial developers had shown interest in the Mossmorran site during the post-Inquiry period, but the interest had not been sustained because planning permission had not at the time been available, and there was not even any clear indication when the decision

would be taken.

(4) A further effect of the delay, of possible concern to the oil companies, has been to reduce their lead time over other gas processing schemes that had more recently been proposed (including plans for Nigg Bay and Peterhead). This might be potentially important in view of the degree of overlap both in construction requirement for plant, and in end-markets for final products (propane, butane and ethylene).

(5) Various individuals (notably some local authority councillors and members of parliament in Westminster) volunteered their own costings of the delay in terms of North Sea resources and revenues foregone. Their statement, however, do not appear to have found any support from industry. It was claimed (by the former) that the reinjection of gas condensate in Brent will have reduced the total ultimate recoverable output; this had also been suggested by the oil companies at the Public Inquiry. The latter have more recently said, however, that it is not possible to determine whether reinjection will adversely affect ultimate rates of recovery; indeed, it would be conceivable for this to improve them. The other significant consideration in this respect is whether oil is worth more if sold today or left in the ground to appreciate in value for a number of years--a famous old chestnut and fertile ground for economic debate; complicated more than usual in this case by fluctuating world prices for propane, butane, and ethylene. It would appear, therefore, that the direct monetary cost to the nation of the delay cannot be easily estimated, despite various attempts to do so.

(6) The local authorities were dissatisfied about the delay, but they could do nothing to curtail it. No purpose would have been served by open criticism at the time, though more recently the Planning Director of one of the local authority's has voiced criticism of the handling of the delay by the Scottish Development Department. They suffered no significant loss from the delay, given that the eventual decision was one of approval (they do not appear to have been aware of point (3) above) but were frustrated at the "sitting back and waiting" during the long time lag before the decision, particularly in view of their intensive activity before the Public Inquiry.

(7) Hindsight may suggest that withdrawal from Peterhead had not been in the best interest of the nation or of the oil companies. This is strongly refuted by the latter because it could never be guaranteed that the necessary alterations to the harbor could be carried out successfully--possible freak weather conditions at a crucial stage in construction, was the critical consideration in ruling out possible harbor modifications.

6.4. SITE CHOICE

As noted above, the statutory decision procedures are not set in train until a company intending to see a particular site developed for a particular purpose lodge an official planning application for the intended site. This pre-determination of site choice is viewed quite differently by different parties.

The oil companies priority is to satisfy themselves as to the suitability of a particular site. This is likely to include private appraisal of possible alternatives, but does not argue for open (and expensive) interparty debate on them.

The Scottish Development Department issue guidelines for the siting of petro-chemical developments (see Figure 2.4), but consider it inappropriate to remove the siting initiative and choice of "best" site from industry. Thus their siting criteria are based on "satisfying" rather than "optimizing."

The Forth Port Authority's review of alternative sites in the Forth has already been noted (section 4.6).

The Health and Safety Executive undertook to give a provisional judgment in principle on sites chosen by industry for development. They do not, and do not consider it practicable to, issue siting guidelines for complex petro-chemical installations: siting guidelines may be issued in the near future for simple gas storage facilities only.

Although some individuals within the Fife local authorities admitted that a multi-site decision process might be more publicly accountable, they were well pleased that Mossmorran had been chosen, and were not inclined to suggest that other possible alternatives should be considered.

The Action Group's view was that an objective choice of site could not be made by the oil companies alone. There is no *a priori* reason why company, national and local interests should coincide in this respect (an argument which has ample precedent). They were particularly dissatisfied about the refusal of the Scottish Development Department to discuss possible alternative sites at an early stage in the decision process (Edinburgh News 24.4.1977). Moreover, they accused the oil companies of backtracking on earlier stated advantages of Peterhead in their arguments about the advantages of Mossmorran (notably the former site's proximity to St. Fergus), and were unconvinced that a remoter site further north in Scotland was unfeasible.

6.5. APPROPRIATENESS OF STATUTORY PROCEDURES

In questioning the appropriateness of the statutory procedures under which the decision was taken, parties were asking for

(a) a more efficient procedure (and, since the radio-sparks issue caused the greatest delay, a quicker way of settling it);

(b) a more accountable decision procedure, a call mainly (though not exclusively) from the Action Group.

The key legislation involved was the Town and Country Planning (Scotland) Act 1972. The suitability of this deserves consideration since this single act is intended to cover *any* development of land (from home extensions to petro-chemical complexes). Moreover, the Mossmorran-Braefoot Bay plans were of a scale and scope that the District Councils involved had never before had to deal with. An oil company representative suggested that from his point of view a specific Act or Commission of Inquiry for a decision on a development of this scale may have been more appropriate; this would be a radical departure from UK practice and cannot be readily evaluated: the Roskill Commission on the Third London Airport is the closest analogy (but not necessarily a good example to follow). The Action Group questioned the suitability of the 1972 Act on other grounds, namely that it enabled planning permission to be granted for a development for which very few specific design details were available, with the concurrent severe limitation on the depth to which various issues could be brought out (as reviewed in section 6.2.).

Both the Action Group and the Health and Safety Executive (at different times) questioned the suitability of the Public Inquiry for handling issues of public safety. The terms of reference of the Inquiry were ill defined in this respect; neither party could define what the Public Inquiry was supposed to achieve, but both had very different expectations. Adversarial communication between parties at the Public Inquiry was in any case considered to be hardly the best way of investigating issues of public safety.

The Action Group were to point out (February 1977 and at various times subsequently) that the inadequacy of the local Public Inquiry had been recognized by parliament many years previously when a new procedure, the Planning Inquiry Commission, was introduced into the statute books (see under sections 44 to 46 of the 1972 Act). This was intended to deal with projects which involved highly technical or scientific aspects or raised considerations of national importance or required a detailed consideration of alternative sites. These are all aspects which it was recognized could not be evaluated at the local Public Inquiry, except in a most superficial manner. The Planning Inquiry Commission would be composed of between three and five suitably qualified persons with adequate resources and powers to carry out an in-depth study and to call for any necessary specialized research or advice. It would involve a two stage process, the first consisting of a public hearing at which the issues would be established, and any necessary analyses commissioned or undertaken. The second consisting of a hearing at which formal debate of the issues and resulting written analyses could occur. The Planning Inquiry

Commission has never been used (see Department of Environment 1978, for reasons).

The Mossmorran-Braefoot Bay developments were, in the opinion of the Action Group, ideal candidates for a Planning Inquiry Commission. However,

> "The Secretary of State considers that it was possible through the inquiry and the subsequent exchanges to obtain all the evidence needed for a full and proper assessment of the applications lodged by the developers and he cannot therefore see any justification for a Planning Inquiry Commission in the circumstances of these proposals."

Given the perceived deficiencies of the Public Inquiry for a project such as Mossmorran-Braefoot Bay, views expressed towards it from members of the Action Group included "a farce," "a mockery," "a token gesture to democracy." Having been denied a Planning Inquiry Commission they considered it essential to participate in the Public Inquiry as it was their only possible chance of making their views known.

The Action Group were not alone in calling for a Planning Inquiry Commission; the Conservation Society and the (labour) M.P. for Dunfermline were also to lodge an official request. Some members of the local authorities were sympathetic to the suggestion, as it would have clarified the terms of reference of the (equivalent of the) Public Inquiry and would have increased the accountability of the decision process. There were differences of opinion within the local authorities about whether or not the decision process as a whole would have consequently been more or less protracted. The local authorities did not consider themselves the appropriate party to ask for a Planning Inquiry Commission; their views in this respect were not uniformly or strongly held.

6.6. RESOURCES

The resources available to different parties were varied, and it is important to assess what resource constraints may have existed. Time as a resource constraint has already been reviewed (section 6.2). Other resources include expertise, finance and information. The Action Group would claim themselves to be the main party adversely affected in this respect (as an ad hoc group it might be argued that this is rightly so). Although the local authorities considered it necessary, lacking their own internal expertise, to commission (at a cost of 45,000 pounds stg.) private independent consultants to advise on hazard there was no suggestion of severe resource constraints on their own decision involvement.

In addition to their dissatisfaction on timing (see above) opinions expressed by the Action Group suggested the following resource constraints:

(1) technical expertise--although it my have been out of choice to call on their own experts (rather than, say, Friends of the Earth, or other outsiders), they would not have been able to pay the fees of professional consultants anyway;

(2) their financial resources were severely limited (local door to door collections and ad hoc fund raising activities), particularly when compared to those of all other main parties. The cost of their campaign up to the stage of the final Court Appeal was approximately 12,000 pounds stg., raised in the early stages by appeals to the local community, and later by jumble sales, coffee mornings and sale of works.

(3) their relative lack of familiarity with Public Inquiry procedures. Participation at Public Inquiries is an education in itself; since they are "one-off" events, however, it may be too late for amateur participants to put any lessons learned into practice.

(4) availability of information as a constraint on participation has been referred to above (section 6.2); the Action Group were to complain repeatedly that they were being denied information necessary for their cause; the most notable illustration of this aspect arose in June 1978 when court proceedings were (successfully) brought by the Action Group against the Scottish Development Department in order to obtain certain information (the Excell report).

6.7. THE DECISION OUTCOME

The decision outcome (approval, August 1979) met the interests of all main parties except the Action Group. Perspectives offered by other main parties on the Action Group's position in this respect range between the following extremes:

(a) parties will accept decisions that are unfavorable to them provided that they have been arrived at by procedures that can be seen to be fair;

(b) parties will inevitably be dissatisfied with decisions that are unfavorable to them.

The Action Group was immensely dissatisfied and bitter not only with the decision outcome, but also with the procedure by which it had been arrived at. Their campaign did not end with the announcement of the decision. Later that year (September 1979) they lodged an appeal at the Court of Session in Edinburgh against the decision, which was heard the following February but was unsuccessful. Shell awaited this court judgment before commencing site clearance and plant construction. A further possible appeal by the Action Group to the House of Lords and to

the European Court of Human Rights was not pursued; the financial penalty of an unsuccessful appeal was a crucial consideration, having been faced with costs of 900 pounds stg. from their first appeal against the Secretary of State (a sum larger than anticipated because it had not been expected that Shell/Esso would have been parties to the appeal).

6.8. PLANNING CONDITIONS*

Forty-eight planning conditions were attached to the planning permission given by the Secretary of State for the NGL plant with a similar set for the ethylene cracker. The most important of these as regards hazard and safety considerations are those numbered (1) and (3) which were repeated in section 5.6.

The local authorities had suggested a condition similar to (1) at and before the Public Inquiry, following a recommendation by Cremer and Warner (the audit to be to the Council's satisfaction). The Inquiry Reporter on the other hand recommended the audit to be to the satisfaction of the Health and Safety Executive. The Secretary of State decided that it must also be to *his own* satisfaction.

The conditions, however, fell hopelessly short of what the Action Group considered was required. They pointed out (Mehta 1980) that there was no definition in condition (1) above of what the audit is, what form it will take, who will carry it out to ensure its independence and, above all, what standards are to be satisfied. The whole concept of a safety audit that is not carried out until after the plant is built at a cost of several hundred million pounds of both public and private capital was considered to be absurd. Moreover, it appeared that shipping--the most likely source of a disastrous accident--was not covered. (The Health and Safety Executive, who advised that this condition be included, have since said (private communication) that shipping is to be included).

Condition (3) was considered unsatisfactory as it pre-empted the whole question of what electro-magnetic field strengths and levels of power induced in site structures might be, and whether effective steps can be taken to prevent dangerous levels. It also pre-supposed that naval traffic in the Forth could be compelled not to use certain frequencies of transmissions for fear of creating break sparks.

A more general grievance about the planning conditions was that they were so vague that it was extremely doubtful if they could in law be enforced in the event of any disagreement.

Other parties expressed no significant criticism about the planning conditions, and indeed were generally more than satisfied with them.

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*It has been pointed out that no mention is made here, nor elsewhere in the present report, of the agreement between District Councils and Shell and Esso about these conditions and other matters unsuitable for treatment under planning conditions. Heads of agreement were signed between Districts and Shell and Esso at the time of the Public Inquiry. Section 50 Agreements with both subsequently entered into (Section 50 of Town and Country Planning (Scotland) Act, 1972).

CHAPTER 7:
EVALUATION

7.1. INTRODUCTION

With the inevitable benefit of hindsight it is difficult to escape the conclusion that the decision outcome was never in serious doubt. There may have been some refinement in the detail of planning conditions to be stipulated, but there seemed little likelihood on the evidence available (i.e., assuming no significant "unseen" factor), given the well-defined one-sited nature of the decision process, that approval would be refused or that planning conditions would be unduly restrictive. There were eventually forty eight planning conditions for the NGL plant and an almost identical set for the ethane cracker, the most significant of which as regards safety assurances being that a full hazard and operability audit should be undertaken to the satisfaction of the Secretary of State before the NGL plant and ethane cracker could each be commissioned.

There appears to have been early forward momentum towards a decision of approval on the part of statutory authorities involved (local authorities, Scottish Development Department, Department of Energy) and firm interest by the oil companies, which appears to have been little shaken by the relatively long delay over the radio sparks issue. There were few rights of appeal by the objectors on the final decision. Although benefits stressed by advocates of the plant were tangible economic aspects, both local and national--jobs, income, revenues--image and prestige rather than explicit evaluation of these more tangible aspects are likely to have carried considerable weight. At a local level, authorities seem bound in principle to approve the establishment of large prestigious relatively permanent industry in otherwise depressed areas (they would have a hard time arguing otherwise to their electorate). At the national level, credibility and prestige rather than export or royalty revenues,

were probably the strongest of the national interest arguments that eventually counted. Some exceptional evidence on hazard would have had to emerge--in a different league than anything that in fact came to light--to have warranted refusal of the application.

Notwithstanding any inevitability in the decision outcome, the decision itself imposed a judgment over three classic fields of conflict:

(1) a conflict over dimensions--health and safety "costs" and economic "benefits";

(2) a conflict between different levels of spatial resolution--local, regional, national;

(3) a conflict between party self interests--private industry, the public sector, the public.

In the remainer of this chapter, a number of observations relating to heath and safety aspects of the Mossmorran-Braefoot Bay decision will be offered against the background set by these conflicts.

7.2. PARTY EVALUATIONS OF THE HEALTH AND SAFETY DIMENSION

Two themes underly the observations made in this section:

(a) that risks were evaluated differently by different parties, for a number of reasons including perception, knowledge, presence or absence of associated benefits (real and/or strategic), spatial proximity to the source of hazard;

(b) that different parties had different pre-conceptions about what was supposedly being established during the decision process as regards health and safety.

From the premise that the most acceptable risk is one that is unknown, the Cowdenbeath population may have deemed risks to be acceptable because they were ignorant of them. (A judgment of doubtful merit, though whether others should step in to attempt to dispel such ignorance is equally doubtful.)

Knowledge of risks depends on technical expertise applied to the particular characteristics of a given facility, and this in turn is one (but by no means the only) consideration for defining thresholds of acceptability. Allowing for the sake of argument, that the experts of the supporter groups and objectors group had comparable levels of technical expertise, then one of the main discrepancies between the two factions who were aware of potential risks was that the former considered qualitative judgment sufficient whereas the latter called for an explicit quantitative assessment at the planning application stage.

The Action Group argued that quantification was the only meaningful way of relating to any absolute yardstick of risk acceptability, whether it be a residual risk of one in a million in any given year, or some other level. Although most parties referred at some stage to this tablet of stone, the Action Group were sceptical in accepting other parties'

foundations for doing so, given that no quantitative assessment had been performed. An explanation that the qualitative criteria implicitly adopted would themselves ensure a 10^{-6} (or better) result was not in itself considered adequate explanation for not performing a quantitative assessment. It was hardly more reassuring to point to the paucity of the data base on which a quantitative assessment could draw, and thus the lack of confidence that could be placed in any results obtained, or alternatively to the possibility of manufacturing a quantitative risk assessment to given any desired final result--10^{-3}, 10^{-6}, 10^{-9}, 10^{-12}, or whatever. This in turn raises the question of the level of confidence that can be put in the qualitative assessment that was produced. Alternatively, it could have been more directly asserted that the decision process was not the place to establish rigorously the acceptability (or otherwise) of the safety of the proposed installation. Thus the observation remains that the absence of a quantitative assessment, related to the level of the design detail available, restricted the depth to which safety criteria could be explored during the decision process, and the nature of the arguments that could be brought to bear.

The presence or absence of associated benefits may affect personal evaluation of risk acceptability. A lower threshold of risk acceptability may be tolerated if no direct benefits are foreseen, thus providing further possible explanation for the views of the local authorities, the population of Cowdenbeath and the Secretary of State (all perceiving direct economic benefits) against those of the Action Group (standing to gain no such benefits). It would be foolhardy to suggest that a deliberate trade-off was being made by the former parties. However, since all parties admitted to a residual risk (agreeing that there is no such thing as absolute safety) there may be an unavoidable built-in trade-off here, given that the raison d'etre of the plant is economic.

The spatial proximity to the source of potential hazard also affects personal evaluation of risk acceptability, and here again there is a striking contrast between the people of Cowdenbeath and those of Aberdour and Dalgety Bay. These are the communities potentially most at risk from the developments and the massive opposition from the latter cannot be explained entirely in terms of the relative physical hazard potential in each location (though a case could be made here), but rather in terms of socio-economic make-up--un and semi-skilled working class vs. articulate and educated middle class respectively. The following statement from the Cremer and Warner Report (1977) raises but leaves unresolved some interesting and difficult questions: "The criteria of acceptability of risk must be set by the community at risk and not handed down to them as technical statements."

It suggests firstly that there are bound to be winners and losers from such a decision process; in the event, the Action Group fought against the plant (on grounds of safety) and lost; Cowdenbeath would have been bitter had they won and the plant consequently sited elsewhere. Thus the community at risk cannot be left to judge acceptability, because different sections of the community come up with different answers. An equally important observation is that the communities of Aberdour and Dalgety Bay are too small to have a voice on the statutory decision making bodies, notably the local councils. Such minorities have to accept the decision of

the majority, even though the crucial dimension (health and safety) does not affect the majority anyway. Thus, although the electoral majority approved of the developments, most would not be affected by any potential disaster and risk would therefore not enter their utility function. Out of desperation individuals in Aberdour and Dalgety Bay demanded that oil company personnel be forced to live among them (and thus share the same level of risk); the local authorities point out that a few of their own number already do so. This in itself will hardly make the plant safer but it may increase tolerance thereof.

7.3. EVALUATION OF PARTY ROLES AND CREDIBILITIES

Reijnders (1980) has characterized safety debates such as that arising in the Mossmorran and Braefoot Bay as a clash between the rights of industry to operate without undue interference from others, and the rights of local population to live without fear of undue risk from industrial activity. Public authorities (the Health and Safety Executive, the Scottish Development Department, the Secretary of State, local authorities) are given or must assume the role of arbiters in any conflict that may arise, and they in turn may call on advice from elsewhere (in the present case, Cremer and Warner). In this section it will be attempted to evaluate the role and credibility of various parties to the decision, in particular the influence of the Action Group as the party mainly responsible for the length and publicity given to the debate.

Bias in party viewpoints on matters of safety correlated with the wider self interests of those concerned. Some of these related to relatively straightforward matters; thus the Braefoot Bay terminal was described at different times by different parties as "peanuts" and as "the busiest of its kind in the world," hardly compatible descriptions and giving entirely different impressions of its associated hazard potential. Others were more complex; the size of spill required to cause an explosion in various conditions; the likelihood of Dalgety Bay being affected by an explosion at the jetty; the state of the art of hazard control policy abroad, and so on. They may be strategic discrepancies in order to advance party self interests, or alternatively genuine beliefs that were the essential determinants of party viewpoints in the first place. They generated accusations from opposing parties that risks were being either over exaggerated or underplayed ("doomsday" or "valium" scenarios).

The Action Group have been portrayed (Thompson 1980) as a classic "nimby" (a "NOT IN MY BACK YARD" group), and fitting this sectist label with almost tedious conformity. They were an ephemeral group which came into existence purely because of the gas plant application; they are not against liquefied gas in principle (witness their support for remote siting thereof) but only when it threatens to locate in their vicinity; moreover because their existence and principles were so strongly bound up with their own locality, they did not necessarily see a role in their campaign for the Friends of the Earth, or other national environmental lobby, and this would have confused the locally founded nature of their campaign.

The Action Group were regarded by other parties as a classic pressure group, very articulate and extremely well organized, which did all that was legally possible to triumph. Some of their number were criticized for making irresponsible, exaggerated claims, for lacking credibility, having suspicious motives and known for their activities in relation to previous public "causes." Others were given the benefit of having genuine, if misplaced, concerns and residual doubts on safety after the final decision. A Health and Safety Executive representative admitted that in their position he would have joined their campaign (this being a statement relating to the accountability rather than the ultimate stringency of the safety scrutiny).

A devil's advocate may speculate whether the concerns of the Action Group's campaign were real or strategic, i.e., whether their members genuinely considered that they would be subjected to an unacceptable level of risk, or whether safety was being used strategically as the most likely means or ridding what was undoubtedly a quiet and attractive stretch of Forth coastline of industrial development. It would be unreasonable to generalize across all individuals in the Aberdour and Dalgety Bay communities. Interviews have suggested genuine belief of fear on the part of some inhabitants, but the possibility of strong self-interest arguments relating to yachting , visual intrusion and economic losses on the part of others. The fact that a number of prominent Action Group members have moved, or are intending to may suggest real rather than strategic concerns, but little significance can be placed in this observation without further analysis, as Dalgety Bay has a higher than average turnover of households anyway.

A related speculation relates to whether the goal of the Action Group's campaign was to get an acceptably safe plant at Braefoot Bay, or to fight at all costs against any such plant. Again, the assessment is far from straightforward. In view of their call for a quantitative risk assessment and their view of a "one in a million" level of risk, as being acceptable, it would be revealing to be able to observe their response to a quantitative risk assessment whose results were within their 10^{-6} threshold of acceptability. It is tempting to speculate that in this case their campaign would have been mounted on a more sophisticated level-questioning the significance and confidence of such results in order to question further the acceptability of the risk being posed. Alternatively, they may have accepted the results, but this then begs the question of whether this, of itself, would have made the plant safer or the decision process more legitimate.

The speculation that the Action Group were fighting against any plant at Braefoot Bay rather than fighting for an acceptably safe plant finds support in other elements of their campaign, for example their judgment of an acceptably safe installation as one surrounded by a 4 kilometer cordon sanitaire. In other words, an acceptably safe installation at Braefoot Bay and no installation at Braefoot Bay are one and the same things.

Any such speculation on the motives of the Action Group is not intended to pre-judge the merits of their case--either with regard to procedure, or with regard to technical substance. Evaluation of technical substance is not the concern of the present report. Concerning procedure, the above illustrations, even if hypothetical, prompt the observation that the arguments presented at the Inquiry were restricted in depth by the expertise available to various parties and judged only against those of other parties present. This closes the arguments to external assessment and inevitably draws on less than available knowledge and expertise. The Action Group undoubtedly increased the depth and scope of the safety debate during the decision process and considered themselves to have raised serious doubts on safety. During the Public Inquiry it was sufficient for the supporters to convince the Reporter (rather than "world expertise") that such doubts were not significant (which they did). Following the close of the Inquiry further doubts did not even have to be considered by supporters or by the decision taker.

It would appear that many of the imponderables in this decision, notably a satisfactory definition of acceptable risk, are aspects that lack satisfactory resolution universally. Residual uncertainty characterizes the state of the art. The public cannot be given absolute reassurance that their safety will not be put unduly at risk because "absolute reassurance" is impossible to deliver. The Kirkcaldy summing up statement (Section 4.5) reflects (deliberately or otherwise) inherent uncertainty. The Secretary of State's decision justification (section 5.6) suffers no such uncertainty--as ultimate decision taker has avoided anything that might give the decision the appearance of a gamble. A remark by Wynne (1980) may be relevant in this context "The more a decision claims in terms of objectivity and final authority the more vulnerable it is."

Alongside the Action Group's role of increasing the depth and scope of the safety debate, during the decision process it is important to assess whether this in any sense may have a bearing on eventual plant safety, or whether it was purely a question of procedural openness and accountability. They claim to have:

(1) raised issues which would otherwise not have been openly debated; they were particularly keen to emphasize their representations on the subject of open flammable cloud explosions;

(2) been responsible for the most onerous of the planning conditions, namely that requiring a safety and operability audit before the plant could be commissioned;

(3) been responsible for the Health and Safety Executive's decision to scrutinize safety of shipping; and

(4) been responsible for raising the sparks issue.

Through any of these four points it may be that the Action Group made some small positive contribution to "societal learning." This would have been done entirely at their own expense, and (hardly surprisingly) in the face of rather less than thanks from other parties. Each point will be taken briefly in turn.

(1) The Health and Safety Executive maintain that there are no additional aspects which are now going to be scrutinized by them as a result of the Action Group's campaign which would not have been scrutinized anyway. Thus from the Executive's viewpoint, the force of this first point lies in openness and accountability in the decision process, rather than stringency and ultimate plant safety. This is not to deny that the Action Group (and other such groups) have a more intangible rote of "keeping the guardians on their toes".

(2) This (or a very similar) planning condition had also been recommended both by the Local Authorities to the Public Inquiry (following the Cremer and Warner report), by the Reporter and by the Health and Safety Executive. It may simply be a coincidence that this condition had not been used before. The Health and Safety Executive point to the fact that it is now no more than a forerunner of forthcoming legislation (and it may become a routine condition in the future), the Mossmorran-Braefoot Bay decision was nevertheless the first occasion on which it had been stipulated as a planning condition.

(3) The Health and Safety Executive stated at the Public-Inquiry that their concern ended at the loading arm at Braefoot Bay, i.e., would not cover marine activities. More recent statements indicate to the contrary that marine activities associated with that terminal are to fall within their sphere of concern (as well as remaining the concern of the Forth Port Authority). This apparent *volte face* was seized on with some vigor by the Action Group.

(4) The Action Group were apparently responsible for bringing into the open a hazard issue which had been completely overlooked by all other parties to the decision at the Public Inquiry and which was considered by the decision taker to warrant such an unusual delay between Inquiry and decision. The delay is evaluated in Section 7.5 below.

In addition to the role they played, it is also of interest to evaluate the so-called "additional evidence" that the Action Group brought to light following the close of the Inquiry (see Table 5.2).

The incidents must be accepted as vivid reminders of the hazard potential of liquefied energy gases, though since the most dramatic of these, San Carlos, concerned an activity, road transport, and a technology (gas compression by pressurization rather than liquefication), that would not be involved at Mossmorran and Braefoot Bay, this could (and was by other parties) be claimed irrelevant to the case.

Of the reports issued, Canvey demonstrated to the Action Group the necessity and possibility of quantitative risk assessments. They were keen to emphasize that although this report and its public availability had been officially heralded as a major step forward in hazard control policy in the UK, such an exercise for Mossmorran-Braefoot Bay had been continually refused.

The main conclusions in the impressive General Accounting Office report advocating remote siting of LEG installations were noted to be crucially at variance with UK practice, and in particular, with the Mossmorran-Braefoot Bay decision.

Although it might reasonably be argued that this report was much more important post-Inquiry evidence than the radio sparks issue, there was no response from statutory authorities on the implications (if any) for the Mossmorran decision. The Action Group claimed to have found further deficiencies in UK hazard control policy when they compared siting practices here with what appeared to be happening abroad, notably in the Netherlands and in California--ample cordons sanitaire (4 km and 7 km, respectively), and use of quantitative risk assessments during the decision process.

The results of their post-Inquiry partial quantitative assessment have already been tabulated (see Table 4.3). Various other parties have pointed in general terms to the inappropriateness of using Canvey data to a Forth Estuary study, to the crudeness of the methods used, and hence the unreliability of the results. These, however, could easily be said to be arguments for a more sophisticated study of this kind, if the concept of openly debating the safety of a proposed installation is to be taken seriously, rather than arguments that point to the complete irrelevance of the Action Group's shipping hazards report. The fact remains that this report produced results crucially at variance with "acceptable" levels of risk, and no official written response was given.

The imposed resolution of the Action Group's objections came largely by way of the planning condition requiring that a full hazard and operability audit should be carried out before the plant could be commissioned. The Action Group's dissatisfaction with this condition has already been noted (section 6.8), and although answers to some of their grievances are now available (the oil companies are responsible for its preparation--either internally or by using outside consultants; the Health and Safety Executive will scrutinize it; the standards to be adopted are those in the Health and Safety at Work Act) these were not explicitly stated at the time and in any case fall short of what the Action Group considered to be required. Their most significant outstanding grievances were that the conditions were vaguely worded and the audit may not be open to public scrutiny; even if it is, any questions that may be raised need not be officially answered.

The UK Advisory Committee on major hazards makes the apparently reassuring point that it is not sufficient for safety to be achieved, it ought to be seen to be achieved, and the role of the Health and Safety Executive in the Mossmorran-Braefoot Bay decision process as independent arbiters of safety will be appraised with this statement in mind (although in doing so, it must be stressed that their public involvement in the Mossmorran-Braefoot Bay decision is neither typical of more recent practice, nor representative of their more exhaustive "unseen" safety scrutiny). The statement itself asks for much more than what is required under the Health and Safety at Work (etc) Act.

The cornerstone of this Act is that operators of potentially hazardous installations are required to ensure, as far as is reasonably practicable, that neither their employees nor members of the public are exposed to risks to their health and safety as a result of their activities. The key philosophy here is that the prime responsibility for safety lies with industry, but the painstakingly chosen wording of the statement though stemming from the infeasibility of absolute reassurance, leaves much scope for subjective interpretation (what is reasonable practicability?, what level of risk is implied?).

The rather generalized statement issued by the Health and Safety Executive (Appendix 4) was as much as they were required to issue, as was their rather paternalistic tendency to consult with industry, other statutory authorities, but not the public. In many cases, the public ask for no more than this, but in the Mossmorran-Braefoot Bay decision, the public were asking for considerably more. There was either an ensuing loss of confidence when it was not forthcoming, or alternatively, accusations of ground shifting when the Health and Safety Executive adapted their position.

It cannot have helped that the Health and Safety Executive were apparently unaware of the existence of the Action Group until the Public Inquiry opened. Lengthy preparation anticipating all contingencies (notably in this case, unexpectedly articulate and well organized citizens Action Group) is, however, both expensive and resource intensive, so that although the Health and Safety Executive may have been aware that their advisory role is less than certain members of the public may have expected, it was not considered their role or within their scope to take the initiative to increase public accountability in this respect. They are satisfied with the sharpness of their own teeth when it comes to enforcement of the Health and Safety at Work Act, and moreover, satisfied that this Act itself (and associated positions) is sufficiently powerful for controlling potential hazard (i.e., safety will be achieved although it may not always be possible for it to be seen to be achieved).

The Robens philosophy that the prime responsibility for safety should lie with industry--underpinning the Health and Safety at Work (etc) Act--might appear to be an unnatural partner for the call for greater public accountability. A sceptical public may remain unconvinced that industry self interest is itself sufficient as the cornerstone for ensuring acceptable levels of public safety, but the body they turn to for reassurance and arbitration base their activities on a belief that it is sufficient. A counter argument that may be offered here, that people competent at risk assessment are few and (therefore) belong in industry, does nor answer doubts from some sections of the public on this point.

Accountability apart, the fact remains of the considerable gulf between the Health and Safety Executive's judgment that the Mossmorran and Braefoot Bay sites are acceptable for their intended purpose and the Action Group's judgment that they are not. Being inherently subjective judgments greater accountability alone may not finally resolve the difference. A crucial point nonetheless is the Action Group's lack of confidence in the Health and Safety Executive which related to their level of expertise and to their claim of independence (notably of government

policies), as judgements on acceptable risk by the public may finally relate to their level of confidence in their safety scrutineers, the Health and Safety Executive.

The advisory role of the Health and Safety Executive in the planning process deserves further examination. They were by-passed as the main risk consultants by the local authorities in favor of Cremer and Warner for reasons given above. It emerges however, that the Health and Safety Executive appear to have little support for the Cremer and Warner report that was produced--they would have required more detailed plant design information. Thus the nature of an advisory report on a planning application produced by them would have been very different. (It is interesting to note that the Health and Safety executive now specify minimum criteria on the content and form of such a report for a major hazard planning application).

The statutory decision taking authorities did not pursue the above-noted difference or the reasons for it but instead accepted the Cremer and Warner report as being full and independent. These adjectives deserve close examination. Use of the word "full" for a non-quantitative report based on generic plant design, which itself admits to have given only limited consideration to marine activities seems questionable. Moreover, the so-called "full" hazard impact report (Cremer and Warner) is much less than required in the "full hazard and operability audit" stipulated as a planning condition. Indeed the Secretary of State also observed that the question of safety of the plant could *not* be *fully* determined until detailed plant design was known. It was never explicitly stated what was supposedly being established as regards safety during the decision process. It would be interesting, moreover, to enquire what differences in form and content for the main written risk assessment may have arisen if the Action Group had been involved in defining the brief (a quantitative report?, a more thorough consideration of marine safety?).

7.4. EVALUATION OF THE STATUTORY DECISION PROCEDURES

The foundations of the Town and Country Planning (Scotland) Act 1972 were laid in a 1947 Act of the same name, at a time when industrial technological developments were considerably less advanced than they are today. It is not surprising that parties to the decision were less than satisfied with statutory procedures which were designed for projects of less scale and sophistication (home extensions, industrial projects of less complexity). Moreover it was the parties who otherwise had least in common with each other--the oil companies and the Action Group--who were to express the greatest dissatisfaction on this count. Each may have preferred some form of commission of Inquiry, though each for different reasons and each with different objectives in mind.

Much has been written on the UK Public Inquiry system (see, for example, Sieghart 1979) and its relative weakness in the face of the increasing complexities it is called on to handle. Wynne (1980) summarizes some of its considered deficiencies in remarking that although issues

may be opened up to wider participation at the Inquiry itself, analysis of the debate is kept strictly confidential, and ultimate control and termination (not necessarily resolution) of the participation by the Secretary of State is ensured. Official response to incomplete evidence at the Inquiry or afterwards does not have to be given (witness the Action Group's unanswered questions at and after the Inquiry). From the objectors viewpoint, anything still uncertain should mean adjournment or reopening of the Inquiry, and postponement of the decision, and their frustrations are fueled when this does not happen. On the other hand, the proponents considered that any remaining areas of uncertainty should, by and large, be sorted out away from public scrutiny by the relevant statutory authority, if necessary embodying planning conditions to the required effect. (Though the objectors claimed that the planning conditions themselves can be vague in terms of what would be needed to get them enforced in law). This in some opinions has given the Public Inquiry the air of political theater.

The ritual image of the Public Inquiry may be further enhanced (though not illustrated in the present case study) by the fact that it can only make recommendations which the Secretary of State is free to disregard for reasons that may not have been open to discussion at the Inquiry, for example, merits of policy or overriding national interest. Recent decisions in Scotland illustrating this point are those in respect of Turnhouse airport extension, and (on two different occasions) a petrochemical complex at Nigg; the Public Inquiry recommended rejection of the application- but this was later overruled by the Secretary of State.

Further evidence of ritual may be found in terms of the resource constraints and lack of specific plant detail noted in Section 6, the adversarial encounter between parties in order to establish issues of technical complexity (recent theories and results in heavy gas flow?) and the poorly defined terms of reference of the issues to be debated. Parties may view their participation as an opportunity to "get things off their chest" rather than to influence the decision process itself, or establish the validity of any particular issue. The pace at which the inquiry is conducted and the hearing of evidence by party rather than by issue allows little opportunity for reflection, consultation or further preparation, so that by the time party cases have developed and matured (as they undoubtedly will during the Inquiry proceedings) the Inquiry is over and the chance for further participation has vanished.

Better preparatory work and more extensive pre-Inquiry hearings may go some way to answering such criticisms. Parties are already encouraged to circulate factual information and documents beforehand, and are generally discouraged from using surprise tactics at the Inquiry itself (i.e., by withholding certain arguments until a relatively late stage other parties are less likely to be able to challenge them convincingly). Thus although a need for greater preparatory work and better defined terms of reference may have been recognized, there have been no official moves to act in this respect--witness the continual refusal of a Planning Inquiry Commission. In the Mossmorran-Braefoot Bay case it was refused by a Scottish Office spokesman (25.2.1977) in stating that such a Commission would be used "only where the Secretary of State considers the matter of national or regional importance, or requires technical expertise

or advice not normally available in the usual Public Inquiry procedure." An observer would be forgiven for thinking that this is as much an argument for holding as for refusing a Planning Inquiry Commission for the Mossmorran-Braefoot Bay decision. In an attempt to reinforce his reasoning, the spokesman added "The appointment of a commission would not affect the Secretary of State's responsibility for the final decision."

It is also interesting to enquire about the nature of the Public Inquiry in a wider policy context--namely whether the Mossmorran-Braefoot Bay decision was an enactment of official policy, or whether it was policy in itself. Claims that this was the only suitable site for the development may lend weight to the latter view. (Wynne 1980: "In contrast to the theoretical model in which policy would be made by representative politics and self-selected intervenors at an inquiry would argue only whether or not a proposed development on a given site was a valid enacement of it, specific proposals are now being advanced by big industry in conjunction with government, as official policy in themselves.")

This appears to lend further weight to the inevitability of approval, and also draws further attention to the issue of site choice. In this case there was no forum for probing in depth the oil companies own reasons for their choice of site, and the Secretary of State's remark issued in August 1979 alongside his decision of approval that "no conclusive evidence has emerged to suggest a more suitable site elsewhere" hardly needed to await the end of a three year decision process geared to one specific site before being issued.

7.5. EVALUATION OF THE DELAY

The post-Inquiry delay remains a particularly remarkable aspect of the whole decision process, and will be given further comment here (see also section 6). It is unusual to have a delay of more than 6-9 months between Public Inquiry and decision, and rare for an issue to be raised following an Inquiry which can be deemed by the decision taker to warrant further publicity acknowledged discussion. The delay served a number of functions which are more notable than the radio-sparks ignition results that it was ostensibly set to establish.

(1) It had strategic importance to the Action Group, as already noted above.

(2) An editorial in the Scotsman newspaper, suggested that the decision and participatory procedures were bound to have been full and fair purely on account of the length of time taken.

(3) It may have allowed reflection on and further assimilation of issues at stake (by all parties and by outside observers) and this alone is a benefit denied to a swift, apparently efficient decision process.

(4) A two year period allows an accumulation of knowledge and experience which may lend an aged air to arguments initially advanced. The decision process itself would be never-ending if it had continually to allow publicly acknowledged debate of new knowledge and developments, but to argue that the "public have had their chance at beginning of the period" hardly smacks of genuine consultation. The companies are unlikely to disagree that two years is a long time in the risk assessment field.

The delay resulted in a colossal imbalance of treatment of different safety issues, (one of relatively less importance given the greatest attention).

Particularly in view of this final point, a plausible explanation for the length of the delay is warranted. One possibility is that there may have been some legal difficulty in terminating the issue prematurely once it had been recognized as relevant and additional. More than one party remarked that the decision authorities possibly spent more time with their lawyers than in consideration of specific issues in their own right.

7.6. THREE SCENARIOS.

A self satisfied bureaucrat might see no merit whatever in the Action Groups arguments or cause. At the opposite extreme it might be argued that all their grievances were of sufficient legitimacy to warrant immediate accommodation. As an aid to evaluating the Mossmorran-Braefoot Bay decision process as a whole two extreme explanations or scenarios will be sketched that different observers might offer to underly the actual sequence of events and exchanges that took place. Each scenario if expanded, may be capable in its own way of accommodating most of the evidence.

The first (fictitious) scenario is one in which basic rights are swept aside in the course of technological progress. The decision has been taken at a very early stage in (or even in advance of) the formal procedure, on grounds that are never going to be (indeed, do not need to be) open to wider debate. National prestige; an essential component of energy policy, an unassailable enactment of "the commercial power and adventurism" on the part of the oil companies, might be suitable grounds at the national level; jobs at all costs would be complementary counts at the local level.

The decision having been taken, the procedure itself is then little more than an elaborate exercise in legitimization "a token application of political whitewash", perhaps involving more than the bare minimum of consultation to ensure the appearance of legitimacy. All official agencies and advisers must cooperate (complacently or corruptly) to ensure the success of this railroading job, each in their own capacity. Cremer and Warner fulfill the expectation of producing a report in which no undue hazard is foreseen though some "responsible" additional containment measures were recommended. The early informal public meetings and

later the Public Inquiry (postponed for two weeks to avoid an unseemingly swift decision process, or perhaps legal embarrassment) are no more than "token gestures to democracy"--answering questions on decisions that have already been taken, though costing a lot of people a lot of money. Both the local authorities and the Secretary of State are gullible to empty assurances on safety. A Health and Safety Inspectorate ("slipshod and incompetent") and the Local Port Authority are oblivious to a risk that any reasonable person would regard as unacceptable, thus rubber stamping their approval on the site in principle. Their later consultation and apparent "understandings" with industry on matters of public safety will smack more of collusion than regulation. The decision of approval is not announced when expected because the applicants wish to delay, without seeming to do so--exploitation of Brent behind schedule, late completion at St. Fergus, or a downturn in the markets for the end products might be suitable reasons. What better excuse than a relatively minor but essentially terminable issue of electro-magnetic break sparks from radio transmissions--an issue deliberately spared from the Inquiry for later possible use. (The Action Group might have ruined this plan by raising the issue at an earlier stage). Approval is finally granted and the range of planning conditions, although extensive, are a further sop to the Action Group. The lack of specific detail required at the planning application stage is ideal for this first scenario, as is the sinister association of development control and development planning in the Scottish Development Department. Whatever serious doubts the Action Group may have, there is no significant attempt to accommodate them, and the Group itself is an irrelevant nuisance.

The first (fictitious) scenario might have been constructed by elaborating--if rather unfairly--on some of the more extreme comments made by the Action Group (and sympathizers) at various stages in their campaign. The overall implication is of a corrupt or complacent bureaucracy playing their role in a corrupt procedure. At the opposite extreme it would be possible to construct an alternative (and again, fictitious) scenario claiming procedures that are above reasonable criticism, capable of accommodating all but the public's most extreme views.

However, this as a second scenario would be rather too cosy a validation of procedures, suggesting that the Action Group are bogus extremists, whose campaign has nothing to do with natural justice or reasonable inquiry. In each of these scenarios, opposing factions may discredit the other rather than addressing directly the substance of their arguments. A third scenario may be offered allowing greater integrity on the part of all parties involved, though they still may not understand each others ideologies.

In the third scenario the final decision is the culmination of considered consultation framed by what statutory procedures allow, capable of relatively minor adaptation but nothing approaching a major overhaul during the course of any single decision. All parties have a responsible (though not necessarily identical) definition of acceptable risk. All pursue their interests and responsibilities in their own right, rather than as pawns in an elaborately orchestrated charade or blind to calls for reasonable inquiry and the rights of a minority group. Experienced consultants prepared what at the time was a fairly routine exercise in containment

and advice on a planning application. It is used by their client in a "site screening" capacity (an unacceptable residual risk would have caused withdrawal of their their support for the application) rather than an element in an explicit cost-risk-benefit appraisal, though (possibly a direction for future improvement) not subjected by them to further expert scrutiny.

The Health and Safety Inspectorate, satisfied that the chosen site was suitable in principle for the type of plant proposed, are unaware that an articulate and organized opposition will determinedly press for the basis of their professional judgement to be made more explicit. The weight of their safety scrutiny would be geared, as usual, to the design/operational phase, away from the public eye.

Considering themselves to have superior technical expertise, more stringent safety standards, and that a more explicit basis is required for judging safety at the planning application stage, the Action Group suffer an initial loss of confidence in the Health and Safety Executive which is never to be regained. However, with any adaptation by the latter seized upon by the Action Group as bogus maneuvering, the confidential and sensitive nature of their work, and the political capital apparently sought from the slightest uncertainty, the Health and Safety Executive could not (either then or later) take the Action Group into their confidence in a more forthright demonstration of their professional judgement.

The Action Group are a magnificent illustration of the informed public pressure group in an age of increasing risk awareness, able to give as good as they get in terms of much of the technical argument and not satisfied with implicit verbal reassurances on safety. The debate on safety at the Public Inquiry is, however, piecemeal. A basis for argument is not established (the safety in principle of some ngl plant, some cracker and some downstream of the type of installations in question, or the safety of elements of the actual plant to be built; against what criteria? on whose judgement?), little detail is available, even less is statutorally required. The weight of evidence recommends approval of the application (the implications of a contrary recommendation for other similar installations operating acceptably in the rest of the UK would be quite remarkable. The implications of ignorance or incompetence on the part of the Health and Safety Executive concerning substantial issues on safety would be more remarkable still). However, by the close of the Public Inquiry there are substantial areas in which the objectors considered (and apparently still do) that satisfactory response to their technical case on safety had not been given, and in their view apparent inconsistencies (section 4.8, para. 8) giving ample justification for furthering their campaign and casting doubt on the validity of all safety assurances.

After the Inquiry, the technically new issue of radio sparks adds an unexpected, even perverse, dimension to the decision process as a whole (see elsewhere in this report), and in substance cause for further political capital or legitimate concern (depending on one's viewpoint) for the Action Group. The fact that all other (possibly more significant) post-Inquiry evidence on safety may be deemed to be technically (though not in depth or sophistication) of a kind previously considered, casts further doubt (in view of the Action Group) on any pretence of the safety debate

to being full, open or accountable to the population at most risk. By the time of the final decision, the Public Inquiry may look increasingly like an exercise in legitimization, as the nature and sophistication of its technical argument becomes even more tarnished with the test of time. But to re-open it for any single issue would set a precedent for other issues, and, possibly, infinitely postpone the final decision (and, ultimately, cause greater long term uncertainty and risk?). Thus a decision announced in 1979 is based on an unresolved public debate of 1977.

This third scenario does not depict statutory parties who are either complacently or knowingly overlooking substantial issues of safety. It is hopefully more plausible to suggest that lack of public debate on any such issues does not imply a lack of private consideration by the relevant statutory parties of any substantial issues as may arise. Moreover, the whole scenario would have been somewhat different had there been substantial differences in safety judgement within the bureaucracy (for instance, the Health and Safety Executive disagreeing with Cremer and Warner).

The role of the Action Group in the third scenario is as a maligned but essential component of a societal learning process for the handling of decisions of this type. They are victims of the process, both from the point of view of substance (a final decision that does not suit them) and procedure (a process which, from their standpoint, cannot be seen to be fair) rather than recipients of any future improvements that their own activities (and those of similar groups) might encourage. Resentment, mistrust and frustration fuels their determination as the decision process continues. In some respects this makes their role better performed, but since it involves capitalizing on the slightest weakness by their opponents, they (apparently) cannot be trusted or taken into the latter's confidence, and it might accordingly have become increasingly unlikely for their case to have been directly answered. The Action Group have to pay for the "privilege" of their role (an unavoidable iniquity?) and overcome possibly unusually severe procedural obstacles (court actions in addition to the more familiar public inquiry complaints). Any procedural unfairness may stem largely from the observation that the Action Group does not have equal standing with other parties in the decision process. It may be reasonable as an *ad hoc* group for this to be so, but it should not be used lightly as an argument for pre-empting the merits of a case of denial of basic rights.

The procedure for the resolution of outstanding differences arising from planning applications in the UK is based on natural justice and a sense of reasonableness and fairness, rather than the strict rule of the law, and litigation at the slightest suggestion of infringement of party rights. Without necessarily implying any envy for the alternative system, this (i.e., the UK system) leaves little further redress if it is considered by any single party that fairness is undermined. Thus, although stemming from genuinely held fears on safety, it might be plausible to suggest that the Action Group's main concerns were either irrational (against most reasonable "objective" definitions of risk acceptability) or demanded far higher standards of safety than UK authorities can afford to attain or normally specify. If this is so, their most legitimate concerns are ultimately weaknesses in procedural efficiency and accountability to the population

at most risk and raise questions about the long-standing norms of UK safety practice, rather than issues that herald an irresponsible decision and the siting of a wrecklessly unsafe plant (an aspect of the difference between safety, so far as is reasonably practicable, being achieved and being seen to be achieved).

The weaknesses are founded on profound difficulties in achieving Pareto optimality from any decision having unequal distribution of costs and benefits, given an added emotional twist in the case of potentially hazardous installations, and exaggerated by three years of delay in which procedures are locked, but knowledge and experience moves on. Critical improvement and review should continually be sought, for the victims of the Mossmorran-Braefoot Bay decision might reasonably have expected a better deal. Procedural reforms were already overdue (notably the implementation of a Planning Inquiry Commission) and some have since apparently been made--see below. A re-enactment of the Mossmorran-Braefoot Bay decision process on the basis of more recent practice might be different in many ways.

7.7. A NOTE ON THE ROLE OF RISK ASSESSMENT.

It is difficult from the evidence of the Mossmorran-Braefoot Bay decision alone to suggest what role formal risk assessments should play in planning for a major hazard installation. Different parties have different views on what needs to be established as regards safety, and different views as to the moral, democratic and statutory rights that are at stake. Consideration of these matters invites different possible functions for risk assessments which are confounded further by changes in these views which may occur with time. Moreover, although the main emphasis here is in the role of risk assessments during publicly acknowledged debate in a planning decision, it is recognized that their value is by no means confined to this end, as further use will be made during the construction and commissioning phase. Indeed, the hazard and operability audit to be prepared at this stage can hardly be over emphasized, as regards ultimate plant safety, but this may leave something to be desired in relation to accountability to the population at most risk and the judgement of external observers.

It would seem reasonable for the role of risk assessment to adapt to industrial developments and to public and political pressures. Its role could then depend on what the public or local authorities in various locations demand, in order to avoid unnecessary expense of blanket remedies. This in turn could lead to a position in which the installations that are seen to be the safest are those in the vicinity of an articulate middle class population. Correspondingly those that are not so situated (or, indeed, already in operation before the dawning of the "risk awareness" age) may not be open to the wider peer scrutiny accorded by risk assessment at the planning phase.

If it is held that the role of risk assessment in the planning process needs to be made more effective, the following might be considered:

1. It is necessary to establish minimum criteria for risk evaluation--an aspect on which differing views exist, but for which there was little attempt to find a consensus in the Mossmorran-Braefoot Bay decision.
2. It is necessary to specify a level of plant design detail that will be sufficient to ensure that the results of a risk assessment undertaken during the planning stage will have tolerable confidence intervals.
3. Unless the results of a subsequent risk assessment carried out on the actual plant lie within the range allowed for in the original (i.e., planning stage) risk assessment, then the original study could be deemed invalid. The enforcement of this would require some legal status to be given to the original assessment.
4. The comprehensiveness of the original assessment must similarly be binding on the actual plant- thus aspects omitted from the original report should be included in a subsequent version thereof.
5. It would seem appropriate for private consultants to prepare the original assessment, and for the Health and Safety Executive to scrutinize and judge it. The inter-party dialogue established would lend itself to a more thorough airing of the issues involved, particularly in view of a healthy difference in approach between these two types of risk experts. Moreover, it would be an advance on the present position in which the private consultants (Cremer and Warner) report is not subject to telling open statutory expert scrutiny.
6. Both the original risk assessment and the written expert scrutiny thereof should be publicly available; with a mechanism for independent arbitration of objections that may be raised. Alternatively, something along the lines of a planning inquiry commission might provide suitable machinery to this end.

The risk studies used in the Mossmorran-Braefoot Bay decision process were part of a debate on risk that was unbalanced and inconclusive. Given philosophical interest in the problems being dealt with this can hardly be unexpected. There were, however, a number of specific observations, aside from deeper philosophical considerations, which may be made. The debate was unbalanced in the sense that the weight of debate on various safety issues did not match the relative importance of those issues (marine hazards and radio-sparks appear to have been given disproportionately little and extensive open scrutiny respectively). The debate would appear to have been inconclusive given the absence of agreed criteria on which to judge safety and the weight of unanswered (though not necessarily unanswerable) doubts on safety at the Public Inquiry and in the quantity of post-Inquiry evidence. The debate was limited most fundamentally, however, by the extent of available detail on the outline plans, and it is notable in this last respect, that some important modifications in the handling of planning applications for major hazard

installations have occurred in the UK since the Mossmorran-Braefoot Bay decision (see below). The imposed resolution of outstanding arguments on safety came largely by way of the planning conditions, requiring a detailed hazard audit prior to commissioning, a condition unique at the time. This would be in addition to the normal provisions of the Health and Safety at Work Act and associated regulations.

In retrospect, therefore, the Mossmorran-Braefoot Bay decision may be identified as something of a landmark in the handling of planning applications for major hazard installations in the UK. Although legal advice may have been sought as to the legitimacy of the "hazard audit" as a planning condition, it anticipates forthcoming legislation on potentially hazardous installations, and has more recently been adopted as a matter of course in planning permissions for other liquefied energy gas facilities in the UK. The Action Group may like to think they had at least some influence here; the Health and Safety Executive point to the fact that the forthcoming legislation was being drafted at the time anyway (August 1977); the Cremer and Warner report had recommended a similar condition. The oil companies may be sceptical at being the first guinea pigs of this legislation; the Health and Safety Executive may be glad of the opportunity of a dry run before it appears on the statute books. However, such a condition is not necessarily a valid replacement for giving greater substance to publicly acknowledged risk assessment during the planning process than was the case at Mossmorran-Braefoot Bay.

Another departure from previous practice is that the Health and Safety Executive may refuse to give an initial judgement in principle on the acceptability of planning proposals until a given level of detail is forthcoming (considerably more than available for Mossmorran-Braefoot Bay). Furthermore, it is understood that they now set the scope of safety audits on planning applications, thus it may be expected that future reports of the type produced by Cremer and Warner will have a more explicitly defined brief.

These are significant procedural changes which facilitate a more positive intervention by the Health and Safety Executive (via their recently established Major Hazards Assessment Unit) on planning applications for major hazard installations. But over and above these procedural changes it remains true that the safety scrutiny of installations in the public eye during the decision process can only be a modest beginning of the detailed scrutiny (away from the public eye) they will receive from the Health and Safety Executive in conjunction with industry self-regulation when under construction and in operation. A crucial consideration for some members of the public in reaching a judgment on risk acceptability may therefore be their level of confidence in industry as self regulators and the Health and Safety Executive as scrutineers (see also Otway 1981). The procedural changes that have occurred since Mossmorran-Braefoot Bay are important not only to enable a more substantial role for the content of risk assessment--in terms of scope and depth of safety issues covered--but also to enable a more positive demonstration by the public's guardians of safety to those sections of the public (e.g., the Action Group) who are demanding the basis for their confidence in them to be made more explicit. This will also provide a more explicit foundation for the judgement of external observers on the

legitimacy of remaining doubts.

Notwithstanding these procedural changes, it is doubtful whether the Action Group would have been satisfied with the same final decision. Although their fears on safety were bound up with criticisms of procedure, a number of outstanding fears on safety (not shared by other parties involved) still apparently remain. Indeed, a scenario could be constructed in which the recent procedural changes, allowing a more explicit basis for a debate on safety, give rise to a more, rather than less, vigorous campaign. But that is another case study.

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APPENDICES

Appendix 1. The Peterhead Application

Sites at Peterhead had been Shell's initial choice for the natural gas liquids plant that is now planned for Mossmorran. Mehta (1980) notes that an initial site at Peterhead had been abandoned on the advice of the Health and Safety Executive. Shell lodged a planning application for a second Peterhead Site in February 1976. A public inquiry into the application opened on 25th May 1976 but was adjourned, at the request of Shell, on 11th June on the grounds that results of tests to ascertain the effect on other harbour users of proposed modifications to the harbour breakwater would not be available for several weeks. Cost, time and uncertainty involved in constructing necessary new harbour facilities were reasons given by Shell (in November 1976) for withdrawing completely from the Peterhead site. The Reporter re-convened the Peterhead inquiry in January 1977 to hear arguments on the question of expenses incurred by parties to the May-June Inquiry.

The Reporter concluded that Shell had acted unreasonably in going ahead with the Inquiry when they did, and the Secretary of State agreed that Shell ought to have ensured adequate evidence on harbour conditions (a crucial characteristic of the chosen site) would have been available at the Inquiry. It was therefore concluded that Shell should be required to pay the expenses incurred by the other parties to the Inquiry. Shell made the point that if they had not sought an adjournment of the Inquiry, and in fact proceeded on the basis of the evidence available (ie. and been denied planning permission or been granted it on unacceptable conditions) no expenses would have been required.

Mossmorran-Braefoot was chosen by Shell as an alternative to Peterhead. The key advantage of Peterhead being in close proximity to the gas pipeline landfall at St Fergus would clearly be lacking at Mossmorran, but other factors (see chapter 2.2) combined to make the latter an eminently suitable site. Abandonment of Peterhead coincided with a search by Esso for a site for an ethylene cracker.

The site at Peterhead had not been suitable for Esso and it would appear that Esso were not seriously searching for an ethylene site at the time of Shell's Peterhead application. Both companies later stated it to be a clear advantage of Mossmorran that the natural gas liquids plant and the ethylene cracker could be accommodated on the single site.

The local authorities at Peterhead were strongly in favour of Shell's application, and bitterly disappointed at its withdrawal. They made later approaches to Shell and to Scottish and National government departments to attempt to attract renewed interest in the site, but without success.

Appendix 2. The Gray Park Predicament

Gray Park is a small council housing estate, at the edge of Mossmorran site. From the time when the oil companies first showed definite interest in the Mossmorran site to the time of writing this report, the fate of these households seems to have been uncertain.

The sixty-four houses comprising the Gray Park estate had only recently been renovated, at an estimated cost of between £3,000 and £3,500 per house; it was said to represent a closely knit community, in which many were determined not to leave.

Two related questions arise in relation to Gray Park (i) given its proximity to the proposed facilities, is evacuation necessary? (ii) if so, who should foot the re-housing bill?

During the early (informal) phase of the decision process (July-December 1976) local councillors assured the local residents that they could be re-housed, if desired (it is not clear whether this was an assurance to re-house the community in tact, or in separate dwellings).

The Cremer and Warner report recommended rehousing of Gray Park as a prudent planning measure. The Health and Safety Executive concurred with this view at the Public Inquiry. However, the oil companies did not accept that evacuation was desirable before the natural gas liquids plant and/or ethylene cracker commenced operation. They accepted only that evacuation would be required before the first downstream plant (application (c)) commenced operation.

The Inquiry Reporter concluded that evacuation of Gray Park before the arrival of downstream industry would be premature. This conclusion took into account the fact that both Cremer and Warner and the Health and Safety Executive agreed that it was a borderline case for evacuation, that Esso had agreed to compensate for evacuation at such time as downstream industry arrived, and that Gray Park has a sense of community and absence of vandalism; a substantial majority wish to remain there.

In his provisional decision of approval (March 1978) the Secretary of State concurred with the Reporter's view. He added, however, that the decision on the future of the houses must rest with Dunfermline District Council, who may wish to give weight to considerations other than risk in reaching their decision on the timing of any offers of accommodation.

This left a cloud of uncertainty over Gray Park. The oil companies had agreed to pay compensation if downstream development arrived; the District Council could implement earlier evacuation if they considered it necessary or desirable, but would have no guarantee of compensation. The current position is that it has been decided that Gray Park should be rehoused at an early stage, ie. before the natural gas liquids plant and ethylene cracker become operational. It has not been decided where, but Esso are understood to have agreed to pay compensation.

APPENDIX 3 Initial consultations and objections (Fife 1977)

In view of the scale and significance of the Shell/Esso proposals the local authorities have carried out, both at the "enquiry" stage and following receipt of the planning applications, a very substantial number of consultations with Agencies, Organisations etc. having an interest in the proposals.

All information and questions arising from these consultations have been taken account of and have been passed to S.D.D., Cremer & Warner, Shell/Esso and where appropriate such organisations as Health & Safety Executive, H.M. Industrial Pollution Inspectorate and the Forth Ports Authority.

A determination of the extent of the consultations carried out was considerably assisted by the advice contained in the D.O.E. manual "Assessment of Major Industrial Applications".

From the consultations carried out, objections to the "totality" of the proposals were received from the Edinburgh and District Branch of the Conservation Society (replying on behalf of the South Fife Branch). The basis of the objection was that the hazardous nature of the two immediately proposed plants and the downstream development would make the proposals unacceptable. The Society also considered that a Planning Enquiry Commission would be the most effective means of public examination of the proposals rather than a Public Enquiry. This point was also made by the Kirkcaldy Civic Trust.

Of the other consultees no overall objections were received although objections and reservations were made to certain aspects of the proposals and included:-

The Scottish Wildlife Trust, Nature Conservancy Council and the Royal Society for the Protection of Birds were particularly concerned about bunkering, jetty drainage, and the means of handling bilge water from tankers.

The Association for the Protection of Rural Scotland raised the above points but also mentioned noise from compressors at Braefoot and the visual impact of the two ethylene storage tanks.

The Historic Buildings Branch of the Scottish Development Department registered an informal but strong objection to the visual impact of the jetties on Inchcolm Abbey.

The importance of minimising the visual impact of the plants, pipeline corridor and terminal together with the hazard and noise aspects were emphasised by the Countryside Commission for Scotland.

The Department of Agriculture and Fisheries for Scotland raised questions over the potential side effects from pollution on plants and livestock and commented on the need to maintain undeveloped parts of the Mossmorran and Braefoot sites in agricultural use for as long as possible.

Those consulted both before and after the applications were submitted were as follows -

Ancient Monuments Board
Association for the Protection of Rural Scotland
British Gas Corporation
British Rail
Civil Aviation Authority
Council for British Archaeology
Countryside Commission for Scotland
Crown Estates Commissioner
Dunfermline District Council - Environmental Health Department
- Housing Department
Department of Agriculture & Fisheries - Lands Staff
- Inspectorate of Sea Fisheries
Department of Employment
Department of Energy and the Pipelines Inspectorate
Department of Trade and Industry
Fife/

Appendix 3 (continued)

Fife Regional Council
- Department of Engineering : Roads Division
  Water Division
  Drainage Division
- Finance Department
- Consumer Protection Dept. (Regional Petroleum Officer)

Fife Fire Brigade
Fife Health Board
Fife Industrial Development Authority
Fife Constabulary
Forestry Commission
Forth River Purification Board
Forth Ports Authority
Health & Safety Executive
H.M. Industrial Pollution Inspectorate
Independent Broadcasting Authority
Institute of Geological Sciences
Kirkcaldy District Council - Environmental Health Department
Local Amenity Societies - South Fife Conservation Society
- Kirkcaldy Civic Society
Ministry of Defence
National Farmers Union for Scotland
National Trust for Scotland
Nature Conservancy Council
National Coal Board - Deep Mines
- Opencast Executive
Neighbouring Planning Authorities
- Central Regional Council
- Lothian Regional Council
- Edinburgh District Council
- Midlothian District Council

Queens Harbour Master - Rosyth
Ramblers Association
Royal Fine Arts Commission for Scotland
Royal Commission on the Ancient & Historical Monuments of Scotland
Royal Society for the Protection of Birds
Scottish Gas
Scottish Marine Biological Association
Scottish Rights of Way Society
Scottish Telecommunications Board
Scottish Wildlife Trust
S.D.D. - Ancient Monuments Branch
- Historic Buildings Branch
- Planning Services Division
South of Scotland Electricity Board
St. Andrews University (Marine Biology Department)
Department of Trade

In the week commencing 4th April, 1977 exhibitions were held by Shell Expro and Esso on the advice of the Local Authorities at Dalgety Bay and Auchtertool to afford the public an opportunity of seeing details of the proposals and discussing them with company representatives. The Local Authorities were represented at the exhibitions to provide information in relation to their role and to provide information on the processing of the applications.

RANGE OF OBJECTIONS RECEIVED

From the above publicity a total of over 400 objections were received by the Local Authorities and the Scottish Development Department, at the time of writing this report. This total includes objections and concerns expressed by individuals and organisations.

Most of the objections received make reference to more than one item of concern. In addition, since three applications are involved and advertisements have requested that objections be made initially to the Planning Authorities and latterly to the Secretary of State, objections have often been written to more than one of the Authorities and/or Secretary of State. Accurate analysis of the objections is therefore difficult but the main points made are listed below.

Despoilation of an important and attractive part of the coastline.
Hazard - general.
Proposals should be sited within an existing petrochemical and/or industrial esturine area.
Effects on local wildlife - seal population/birdlife/plants.
Proximity to residential development.
The proposals will result in problems of noise.
Pollution (water/air) general.
Restriction of public access to the shoreline and Inchcolm Island.
Desecration of an area of considerable historic/religious significance and an Ancient Monument.
Recreational damage.
Generation of obnoxious smell/adverse effects on health.
Adverse effects upon sailing.
Contrary to Central Government coastline planning policy.
The proposals will not provide sufficient permanent jobs in relation to the environmental disbenefits; permanent employment will not substantially involve Fife-based personnel.
Adverse effects on residential building on the coastline (particularly Dalgety Bay) and adverse effects on attraction of key personnel to Fife.
Adverse effects on Aberdour as a tourist resort; tourism generally.
Problems of increased (road) traffic generation.
Navigational unsuitability; dangers of terminal location.
Preferable (amenity/navigation considerations) jetty locations exist at Burntisland, St. David's and at other locations on the Forth.
Request for a Public Inquiry Commission rather than a Public Local Inquiry.
Adverse effects on property values.
Lack of overall national planning policy for oil related development.
Shipping congestion/collision risks in the Forth Estuary.
Loss of good agricultural land.
Concerns regarding bunkering, spillage risks; need for proper procedures; suggestions of no bunkering.
Concerns that the products of the plant are to be exported and not for further processing in Fife.
Need for a proper environmental impact analysis of the terminal proposals.
Implications of considering at this stage the wider implications of future petrochemical development at Mossmorran and effects on Braefoot.
Concerns regarding the effects of Ethylene leakage.
St. David's Harbour (navigationally) is superior, has no tidal restriction, less environmental problems and is covered by Forth Ports Authority's radar.

Concerns/

Concerns regarding bilge water treatment, separation of ballast water, and treatment of ship sewage.

Tanker movements will be at high tide; Aberdour harbour is tidal, therefore there will be a critical impact on sailing and a loss of a key sailing area.

Pollution (soot) resulting from periodic flaring of Ethylene.

Concerns regarding increased use of terminal through additional gas finds/landings from the North Sea.

Need to give thorough consideration to the implications of the shortness of the life of the proposals.

Questions of accuracy of the plans and visual impact material submitted by the Companies; comments on the inadequacy generally of the Companies' submissions to enable a proper evaluation of the proposals.

Ecological damage - general.

Unsuitability of building land at Mossmorran (peat/coal).

The proposals are contrary to the approved Development Plan.

Inadequate research into alternative sites.

Such developments should take place only in relation to U.K. needs (depletion policy).

Need to consider a wider range of possible future developments at this stage. Acceptance of current proposals could be an undesirable blank cheque for future development.

Creation of a terrorist target (compounded by the proximity of Rosyth).

Will Aberdour Harbour be used for support vessels etc.?

Need for closer examination of the implications of a proposal which will drain infrastructure investment from other areas of high priority within Fife?

Alternative site/jetty location would be Wemyss Moss/Michael Colliery.

The proposals are contrary to the Fife Regional Report as regards policies for environmental improvement and environmental protection areas.

Needs for the protection of the likely site of Special Scientific Interest immediately north of Gray Park.

Need to ensure that all building materials obtained are from existing quarries, and if not are subject of separate and later planning applications.

Concerns regarding the use of Loch Gelly for fire water and process water discharge.

Need for provision of appropriate containment, drainage and subsequent treatment of drainage water from the loading installation.

Concerns regarding the effects of construction work on the shoreline and wildlife habitats.

Problems resulting from a large (immigrant) constructional workforce.

Braefoot Bay is outside radar surveillance of the Forth Ports Authority and therefore outwith their immediate control.

Visual intrusion (scale of development) at Mossmorran.

Objections to the loading lines as they will affect tree (shelter) belts.

Need for assurances regarding the retention of agricultural buildings at the Mossmorran site.

Adverse effects (amenity/financial) on Aberdour Golf Course (and its extension).

Concerns regarding the floodlighting of the jetty.

The tentative nature of the Esso proposals plus the lack of a guarantee of downstream development make the economic gain slight in terms of the environmental loss.

SUPPORT RECEIVED

Representations in support of the proposals have also been received in a petition (87 signatories). The reasons given for support were:

(a) benefit to economic growth of Fife

(b) benefits to U.K. balance of payments

(c) area suited to maritime industrial development

(d) Braefoot screened from Aberdour/Dalgety Bay and is little frequented by the public.

APPENDIX 4 Health and Safety Executive statements of evidence to the Public Inquiry

5.1. Natural Gas Liquids Plant

General

1. I have studied some of the documents relating to the proposals by Shell to erect a plant for the separation of natural gas liquids (NGL's) at Mossmorran, with export facilities at Braefoot Bay. These include the Environmental and Hazard Survey, and also the Report on the Hazard and Environmental Impact, prepared by Cremer and Warner.

2. All of the materials involved in the processes are highly flammable, and it is therefore of the utmost importance to prevent a flammable concentration in air of the vapours from reaching a source of ignition. This can be achieved by good containment, plant separation, and vigorous control of all ignition sources.

3. Hazards may arise due to two main causes, namely failure of equipment, and of operations. Risks from the former may be minimised by careful attention to design and maintenance, whilst good housekeeping and operator training should reduce the risks from the latter. I think that Shell have shown that their design teams have considered every possible source of risk in the equipment, and have incorporated the necessary safeguards to counter them. Similarly, one may expect that operating procedures and operator training will be to the highest standards in the light of the Company's experience in these fields.

Potential Hazards

4. The areas where hazards due to equipment failure may arise can conveniently be divided into two, namely the processes, and the storage. Hazards connected with the pipelines, and with the harbour operations are discussed elsewhere.

Processes

5. In the process plant, the materials are all at temperatures above their normal boiling points, and are under pressure. Failure may conceivably occur at pumps, compressors, flanges in pipe work, or furnace tubes. Such failure will inevitably result in the release of hydro-carbon vapours to atmosphere, and these may well reach a source of ignition. However, the inventories of the individual items of plant are relatively small, and the size of a vapour cloud will be correspondingly small. In addition, the individual items of plant can be readily isolated, and feed stock diverted to other vessels, or flared off under control. Attention to design and strict maintenance schedules should ensure that catastrophic failure of these items of plant will not occur in practice, so that instantaneous release of the contents of any vessel is not considered to be a credible accident.

Storage

6. Three products will be stored at this site, propane, butane, and gasoline. The first two of these will be stored as refrigerated liquids, whilst the gasoline will be stored at ordinary temperatures. Because these materials will all be stored at ordinary atmospheric pressure, the likelihood of tank failure is remote. In addition, the NGL's are all non-corrosive, and hence will have no deleterious effect on the materials from which the storage tanks will be constructed. Failure of a storage vessel in service is a rare event, and to my knowledge, there have only been three instances involving refrigerated NGL's. These have all occurred with single walled vessels, protected by an insulation layer on the outside. The proposals for storage of refrigerated products at Mossmorran are for double integrity tanks, that is to say, they will be constructed with two concentric walls of special steel. The product will be contained in the inner tank, and the outer tank will be insulated on its outside surface. Thus vapour from the chilled product will permeate the annular space between the two tanks, and the fixed roof will be above the outer shell. In the event that the inner shell will fail, the outer shell will contain the full contents of the tank, but will clearly have to be designed so as to be capable of withstanding the full hydrodynamic force resulting from such a failure. The Shell submission provides for outer bunds of a minimal capacity, in fact capable of holding approximately 10% of an individual tank's contents, this capacity being commensurate with the maximum theoretical leakage arising from ½ gasket failure on the largest pipe below the liquid level in the tank.

7. The tanks will be provided with high temperature, pressure, and level alarms. Remotely-operated shut-off valves will be provided on all lines

below liquid level, and where appropriate, valves will be interlocked to prevent inadvertent product mixing. All tanks will be provided with pressure relief valves, which will be discharged safely, generally to the flare system. The relief system will be of sufficient capacity to cope with over-filling, variations in atmospheric pressure, or a failure of the refrigeration systems. Failure of the refrigeration equipment associated with the low temperature storage would result in a very low rate of evaporation of the stored product. This is because the insulation of the storage tanks is such that heat transfer from the surrounding atmosphere is minimal, so that the rate of evaporation of the tank contents would also be minimal, and well within the capacity of the relief system. Day to day variations in atmospheric pressure would be dealt with by the refrigeration equipment, but under abnormal conditions, the relief system would be designed to deal adequately with the maximum rate of vapour boil-off.

8. Fixed water sprays will be provided on the storage vessels, so that cooling water can be applied to any tank or tanks in the event of a fire occurring at a neighbouring storage vessel. In addition, portable monitors will be provided, and can be operated from strategic positions.

The Effects of Leakage of Flammable Materials from Storage.

9. The possibility of catastrophic failure leading to the release to atmosphere of large quantities of flammable vapours is one that may properly be considered to be remote. Small leaks, which could in theory become aggravated so as to involve other items of plant may occur, but the risk from these may be reduced to small proportions by the use of sound practice in the design and materials of the highest quality in the fabrication of the plant. The risk from small leaks which are the consequence of normal wear and tear on plant may be greatly reduced by good maintainance and housekeeping.

General Conclusions.

10. It is my opinion that provided the process and storage are designed,

constructed, maintained and operated to the highest standards currently available in the petroleum industry, there will not be an intolerable situation imposed on the surrounding neighbourhood, and there need not be any insuperable objections to these proposals.

11. The proposed site for the erection of a NGL's separation plant at Mossmorran is well separated from existing industrial developments. However, a housing estate at Gray Park is only 800m from the site boundary, and would be approximately 1300m from the process area, 1000m from a refrigerated LPG storage tank, and 900m from a gasoline storage tank. It is my opinion that these separation distances are questionable, and that the residents of this estate should be rehoused away from the area before the NGL's separation plant is built.

R.V. Fuller.
13 June 1977

5.2 Ethylene cracker and downstream development

1. The outline proposals for the construction and operation of an ethylene cracking plant adjacent to an NGL separation plant at the Mossmorran site have been carefully considered.

2. No details of size or type of plant have been provided by the firm so that it is only possible to say, at this time, that providing the cracking plant, which presumably involves no new technology, is designed, constructed, installed, operated and maintained to currently acceptable standards there should be no reason to suppose that the plant will present an unacceptable risk either to people working on the site, or beyond the site boundaries.

3. Proposals for down-stream developments have been referred to but no definite selection of specific processes has yet been made. When such selections are submitted care will need to be taken to ensure that each proposal is viewed according to the risk. Any down-stream developments should meet current design and safety standards and sufficient separation in-plant and from the boundaries should be provided.

4. All installations where flammable liquids, gases and vapours are stored and used at elevated temperatures and pressures will give rise to some residual risk which cannot be completely accounted for either by location or safety precautions. Consequently, further safeguards should be provided in the form of additional safety separation, a cordon sanitaire, around the site. In my opinion the residents of Gray Park should be rehoused away from the area before the proposed Ethylene Cracking or NGL Separation plants become operational.

5. If the Local Authority approves the firm's outline proposals, then careful consideration of the detailed proposals which will subsequently be forthcoming, will be necessary. Any such proposals will need to meet the requirements of the currently accepted standards as referred to in paragraph 2 above.

13.6.77

APPENDIX 5 Reporters conclusions from the Public Inquiry

60. General Conclusions

Having given full consideration to all the foregoing matters I have concluded that it is proper for the developments at Moss Morran to proceed. Doubts which were raised on safety factors are not sufficient to cause me to believe that these plants cannot be designed to operate within an acceptable level of hazard. The requirement of a satisfactory hazard and operability audit should ensure that level is reached before plants are commissioned. Nevertheless, I recognise that even if acceptable hazard limits are reached, with the risk of injury to the public being a once in a million year occurrence, this does not guarantee that such injury would not occur in the first 10 or 20 years of operation. For this reason, I would include among the other factors involving a loss of amenity, the unease which will be felt by local residents at the introduction of a major hazard installation.

61. At Braefoot Bay the position is more sensitive due to its landscape value and proximity to 2 communities and to Inchcolm. This is a site where industrial development would normally be refused but the national interestarguments in favour of allowing the NGL facilities to be established to avoid wasting the Brent Field resources are compelling. This persuades me that the Shell application should be granted but if the Esso application were submitted alone, I would find it difficult to find that the ethylene exports had to be made at Braefoot. Once the Shell development proceeds, the addition of the Esso facilities makes economic sense and should be permitted, provided no further expansion is allowed.

62. Nevertheless I have some reservations regarding the Esso facilities at Braefoot. Whereas Shell will only have the control and support facilities necessary to operate the terminal, Esso will have their product storage and refrigeration plant there and I have already suggested the need for fully redundant secondary containment for these storage tanks. In addition, the Esso jetty will be very much closer to the perimeter fence at Charleshill and it is possible that the hazard and operability audit could show that prudence would require further land to be acquired to take the boundary fence further back - say to the ridge along Charleshill - to keep the public out of a possible area of hazard.

63. I accept that the benefits which will flow from these developments will be felt mainly at national level. The employment opportunities from the NGL plant are few and, apart from the construction trades, local communities are likely to benefit materially from employment opportunities and spin-off only if the cracker and downstream activity also go ahead. Dalgety Bay and Aberdour seem unlikely to receive any direct benefits from the developments but, provided the hazard risk is shown to be within acceptable limits, I consider that the overall benefits which will flow to the wider community outweigh the loss which the local communities will suffer.

64. I have considered the other arguments put before me but do not consider that they justify me in reaching a different conclusion.