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AECB-1139/REV-1

THE LICENSING PROCESS FOR NUCLEAR POWER REACTORS - REVISION 1

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PAPER

November 21, 1979

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DIAGRAMS

FIGURE 1: Overall Schematic

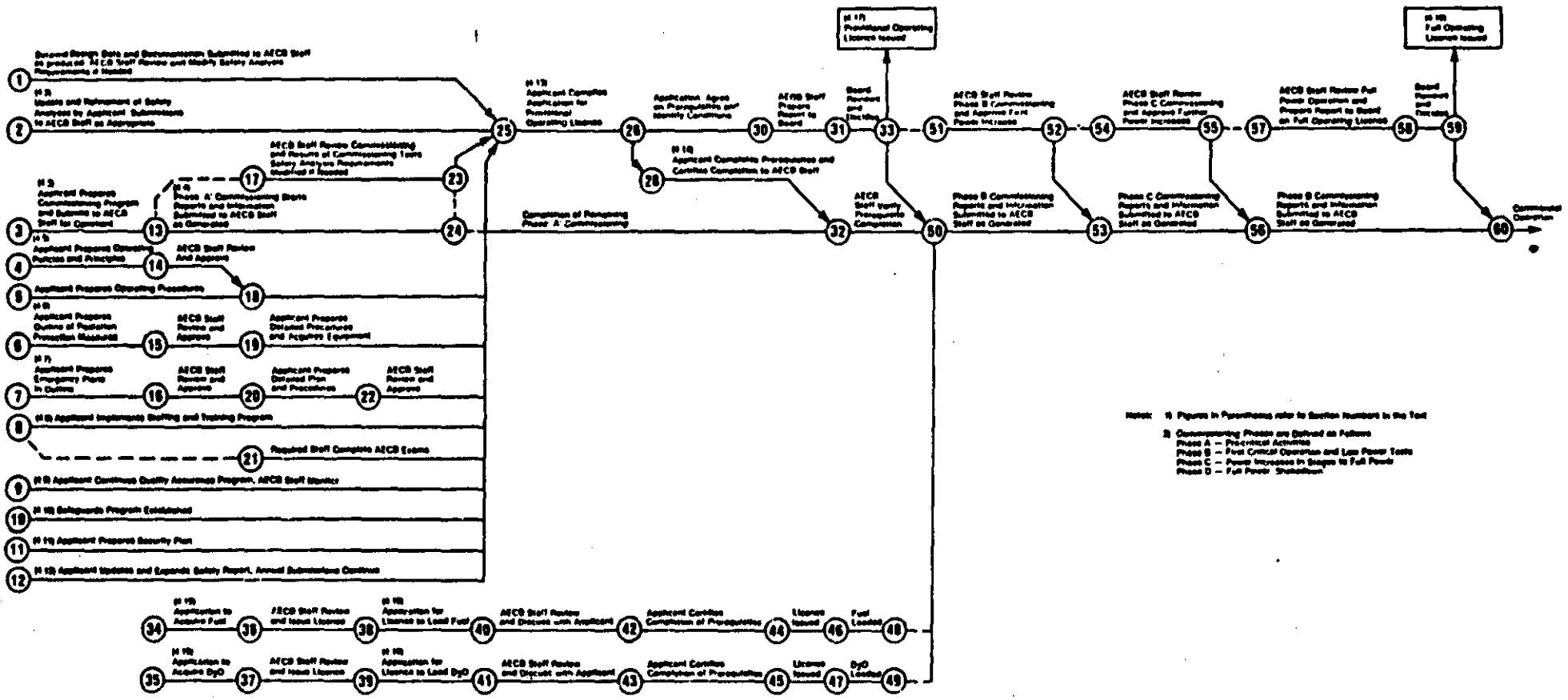

FIGURE 4 SCHEMATIC OF ACTIVITIES LEADING TO OPERATING LICENCE

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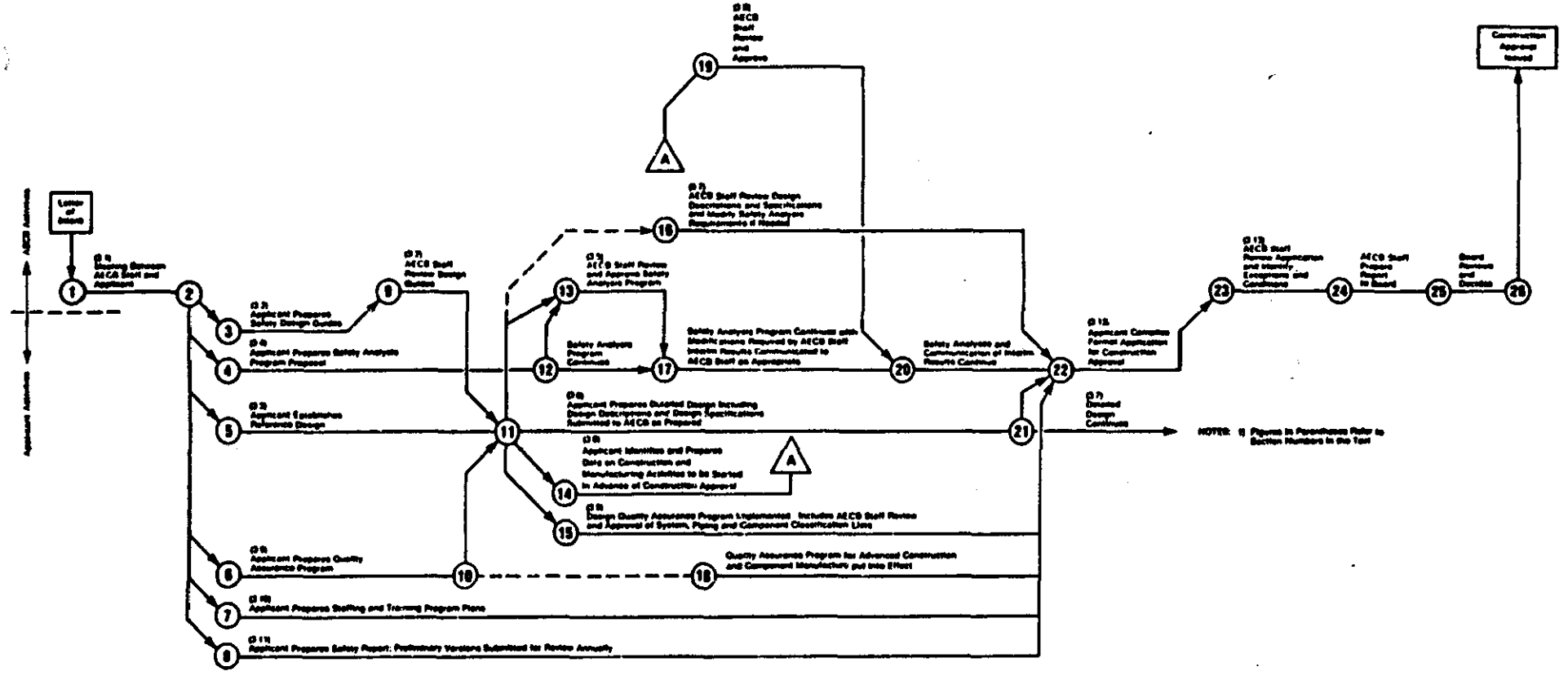

FIGURE 3 SCHEMATIC OF ACTIVITIES LEADING TO CONSTRUCTION LICENCE

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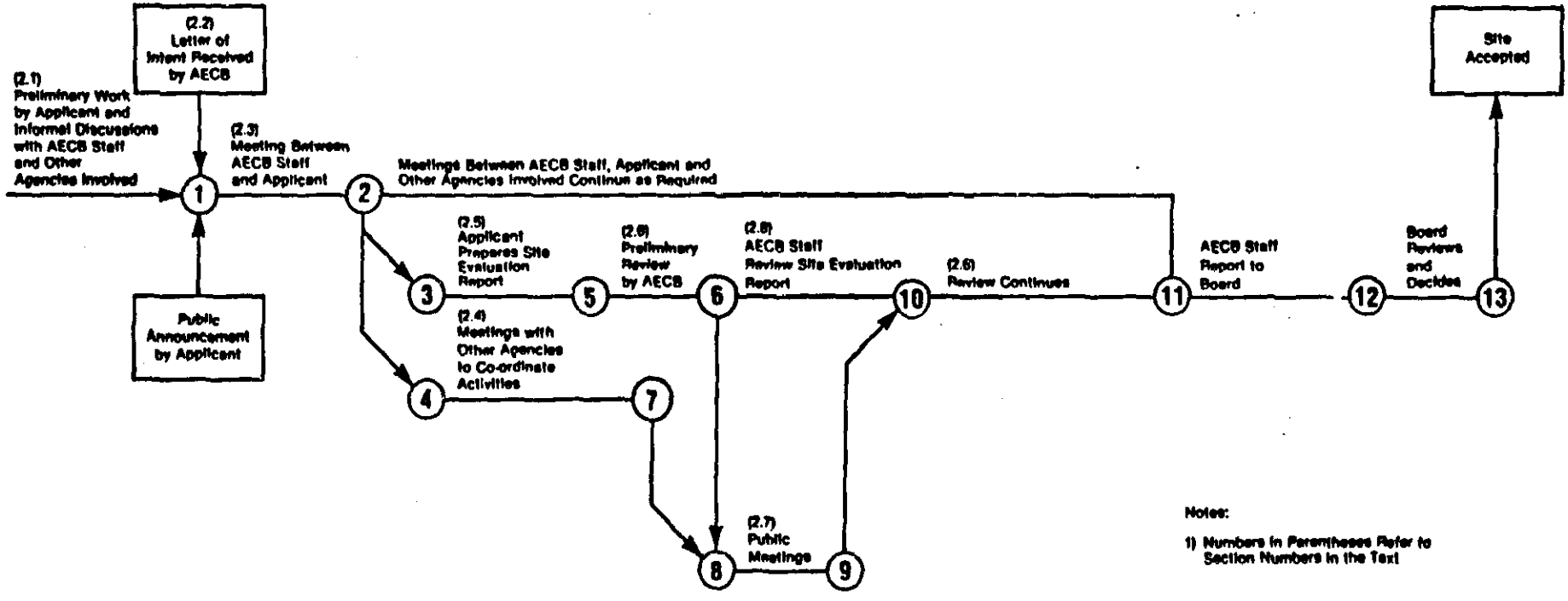

FIGURE 2 SCHEMATIC OF ACTIVITIES LEADING TO SITE ACCEPTANCE

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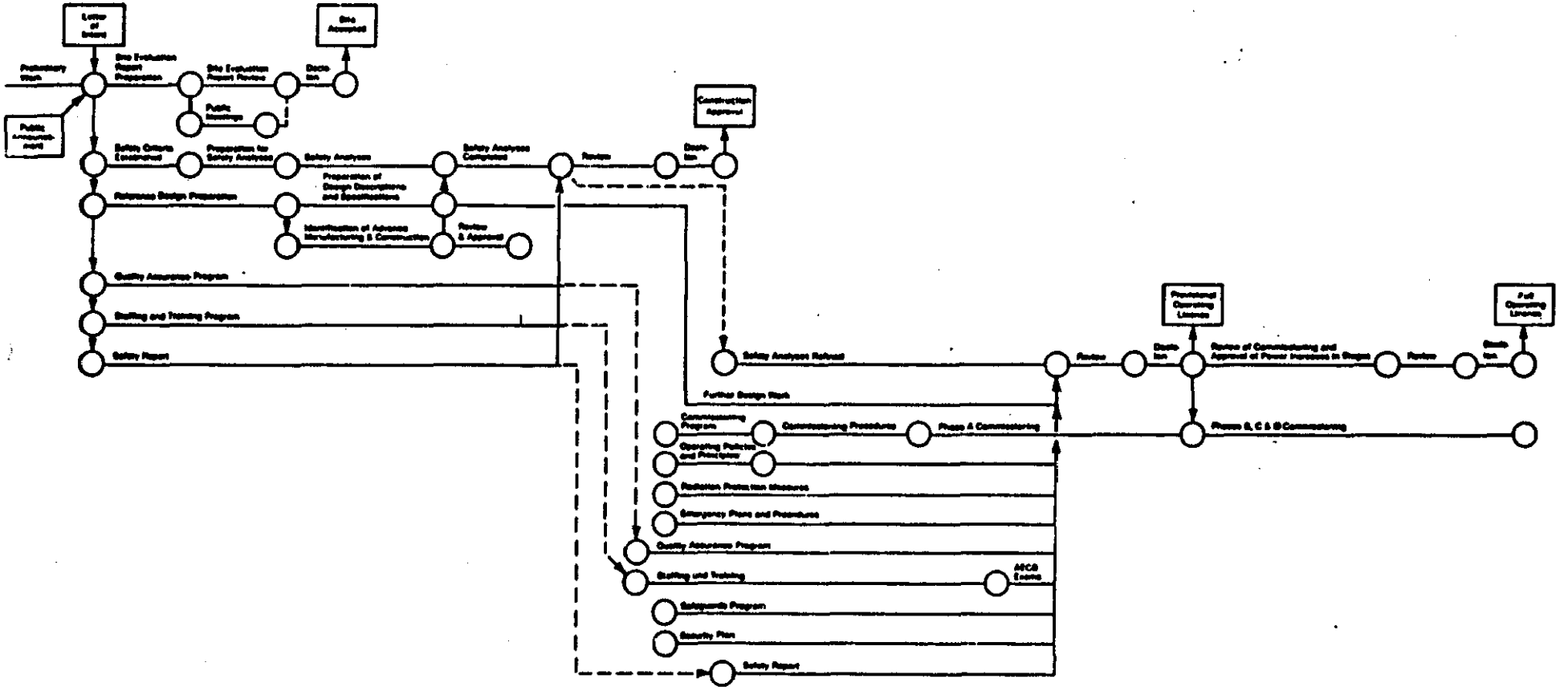

FIGURE 1 OVERALL SCHEMATIC

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The Licensing Process For Nuclear Power Reactors

This document describes the major activities and steps required by the Atomic Energy Control Board (AECB) in the Licensing of a commercial reactor. Although the process described is based on and is broadly consistent with past practice, some modifications have been made. In particular, certain elements of past practice have been made more explicit and are stated as requirements. The document thus represents how the AECB currently intends to proceed under its existing legislative mandate[1] and regulations[2]. The process described is presently being applied to Ontario Hydro's Darlington nuclear generating station.

The AECB's approach to licensing is not static and improvements to the process are under active consideration. Accordingly, the AECB welcomes comments and suggestions from members of the public or other interested parties. These should be sent to:

Director, Reactor and Accelerator Branch
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1. Atomic Energy Control Act, R.S.C. 1970, c.A.19.
2. Atomic Energy Control Regulations, SOR/74-334, 4 June 1974, as amended by SOR/78-58, 16 January 1978.

1. INTRODUCTION

The licensing process is the means by which the AECB gains assurance that a nuclear facility will be sited, designed, constructed, commissioned and operated in compliance with safety criteria and requirements established by the AECB. This is achieved by establishing communication with the applicant at an early stage in the project and maintaining surveillance over all safety-related activities in each phase of the project from the initial conceptual design of the facility through to its mature operation. AECB staff are involved, not only with the review of the end product of each of the applicant's activities, but more particularly with the review of the process which produces these results. The intent is to identify points of contention at as early a stage as possible. In this manner, an attempt is made to avoid situations where the applicant will be under considerable economic pressure to resist changes required by AECB staff and to enable areas of disagreement to be resolved in an environment that allows both parties to achieve their goals.

The process of licensing a nuclear facility can be considered to take place in three phases, the end-point of each being marked by the AECB issue of a) site acceptance, b) a construction approval, and c) an operating licence. Although the end point of each phase is clearly delineated, the activities that lead up to these points overlap. Thus activities which are relevant to an application for an operating licence can commence before either the construction approval or site acceptance is issued. Figure 1 shows an overall schematic which links each of the three phases together. Figures 2, 3 and 4 show a more detailed breakdown of the activities of each phase separately. The following sections provide an explanation of the activities shown in each of the three schematics.

2. SITE ACCEPTANCE

The objectives of the activities of this phase of the licensing process are to establisn the conceptual design of the facility and, through investigation of site characteristics, to determine whether it is feasible to design, construct and operate the facility on the proposed site and meet the safety requirements established by the AECB. It is during this phase that the applicant is required to announce publicly his intentions to construct the facility and to hold public information meetings at which the public can express its views and question applicant officials. The AECB is not direclty involved in the site selection process and only judges a particular site to be either acceptable or unacceptable.

2.1 Preliminary studies

Although the AECB is not formally involved at this stage, it is to the advantage of both parties if the applicant 'informally' notifies the AECB of its activities and allows discussions to take place between the staff of both organizations. Initial contact should be made with the Director of the Reactor and Accelerator Branch who will nominate an AECB staff member to whom communication can be directed and through whom meetings with other AECB staff can be arranged. Preliminary meetings with other agencies involved are also held at this stage.

2.2 Letter of Intent

Receipt of this letter by the AECB constitutes formal notification of the applicant's intention to construct a nuclear facility at a particular site. The letter should be addressed to the President and should be accompanied by:

- a description of the type, size and major characteristics of the nuclear facility being proposed;

- a description of the site and its location;

- a basic schedule covering the design, construction, commissioning and operation of the facility;

- a basic organization chart which shows each part of the applicant's organization concerned with the project and which identifies the individual with whom the AECB staff will communicate.

The AECB makes public its receipt of this letter. Any public announcement intended by the applicant should thus either precede this event or be co-ordinated with the AECB's information release.

2.3 Meeting of AECB and Applicant Staff

The general purpose of this meeting is to consolidate the results of the less formal discussions that precede the letter of intent, to ensure that the

applicant understands the AECB's licensing requirements, and to reach general agreement on the manner in which the licensing process is to be handled with specific attention to the site acceptance phase. The specific items covered at this meeting will include:

- establishing lines of communication;

- ensuring that the applicant possesses all relevant AECB documents;

- identification of documents to be produced by the applicant on whose distribution the AECB is to be included;

- agreement on modifications and additions to the sequence of activities leading to site acceptance shown in the attached schematic (figure 2), together with a preliminary allocation of time estimates and key dates;

- identification of other federal and provincial agencies involved;

- identification of consultants to be used and their role in the project.

The applicant should produce a document control procedure or similar document that lists the individual and series of documents to be produced both by the applicant and his consultants. As the AECB endeavours to make the maximum use of these documents rather than requiring special reports, the applicant should

have a clear idea of the breadth and depth of information to be contained in each document listed.

2.4 Meetings with Other Government Agencies

Where the AECB's jurisdiction overlaps that of other federal and provincial agencies, AECB staff will arrange meetings to ensure that the various activities are efficiently coordinated and are interfaced with the AECB licensing process.

2.5 Site Evaluation Report

This report accompanies the application to the AECB for site acceptance. Its intent should be to demonstrate that the site characteristics are suitable for the design, construction, commissioning and operation of the facility within the AECB's safety requirements. Although the emphasis of the report's contents will be on the identification and investigation of those site characteristics which bear on safety, the report must also contain sufficient information on the conceptual design and operation of the facility together with such preliminary safety analyses as may be necessary in order that a judgement of the site's acceptability for the particular design chosen can be made.

2.6 AECB Preliminary Review

If desired by the applicant, the AECB will give the Site Evaluation Report a preliminary review with the object of identifying any major obstacles to site acceptance before public participation meetings are scheduled. Indication by the AECB that it sees no such obstacles or that those identified can be resolved

by further action on the part of the applicant does not constitute any commitment to later site acceptance.

2.7 Public Meeting

The AECB has required, as a prerequisite to site acceptance, that the applicant hold at least one public meeting in the vicinity of the site to inform the public of its intention and to provide an opportunity for members of the public to express their views and to question applicant officials. These meetings have not been required to be public hearings and participation by AECB staff has primarily been as observers. AECB staff have, however, been prepared to respond to questions dealing with the licensing process and the AECB's role.

The AECB has required the Site Evaluation Report to be made available to the public at least three months before the public participation meetings were scheduled. Although this document has formed the primary information base for the meetings, the applicant has been encouraged to produce additional documents which summarise the contents of the Site Evaluation Report in a less technical and more easily readable manner.

Currently, it appears unlikely that any proposed nuclear power project would proceed without some form of publicly open environmental impact hearings, initiated by the appropriate federal or provincial authority. Clearly, any such hearing would more than satisfy the above AECB requirement for a public meeting. It can be expected that there would be an opportunity for AECB staff to submit a written brief at any hearing and, at the discretion of the hearing body, an AECB staff member would be available to present the brief orally.

2.8 AECB Staff Review

The final Site Evaluation Report forms the basis for review. AECB staff prepare a report which is reviewed by the Board in order that it may reach a decision on site acceptance.

3. CONSTRUCTION APPROVAL

The AECB's primary concern during this phase of the licensing process is to assure itself that the design meets the AECB safety requirements. In order to do this, it is necessary that the design be sufficiently advanced to enable safety analyses of a specified set of hypothesized events to be performed and their results assessed. Construction will only be authorized once the design and safety analysis programs have progressed to the point that, in the judgement of the AECB, no further 'significant' design changes will occur. Where design development is still in progress at the time for issue of a construction approval, the AECB must be assured that, when complete, its potential impact on the results of safety analyses will not result in significant modifications being required to systems or components that would be partially or fully constructed. This is normally ensured by using conservative extreme values in the safety analyses. Emphasis is thus placed on review of the safety analysis program and development of the detailed design in the context of the design quality assurance program.

3.1 Meeting of AECB and Applicant Staff

The general purpose of this meeting is to reach agreement on the manner in which the activities that lead to a construction approval are to be handled. It

parallels and can be incorporated into the similar meeting held for the site approval phase (see 2.3). In effect, the intent is to establish the 'ground rules' and to ensure that the applicant understands the basic safety requirements laid down by the AECB. The items to be covered at the meeting will include:

- establishing lines of communication which should include a submission by the applicant of project organization charts which show the individuals responsible for all the various aspects of the project, including links with outside organizations and members of their staff with whom AECB staff would communicate;

- identification of the standards, codes and guides whose use is required by the AECB;

- identification of documents to be produced by the applicant on whose distribution the AECB is to be included;

- agreement on modifications and additions to the sequence of activities leading to a construction approval shown in the attached schematic (figure 3) together with a preliminary allocation of time estimates and key dates;

- agreement on the preliminary 'matrix' of safety analyses to be performed;

- the scope of the quality assurance program.

It is anticipated that, as one result of this meeting, the applicant will draw up a more detailed licensing schedule, based on figure 3 and the necessary agreements reached. This schedule should be updated regularly and can be routinely reviewed at subsequent meetings.

3.2 Nuclear Safety Design Guides

These documents are prepared by the applicant and transform the basic safety criteria set by the AECB into a set of detailed instructions that communicate to the facility designers the particular requirements and standards that must be met by safety-related systems. Review of these documents by AECB staff is required to verify compliance with the AECB requirements and to ensure that the series of documents is sufficiently comprehensive.

3.3 Reference Design

The outcome of this phase of the design is a reference design which fixes the major parameters of the facility and identifies its component systems, major equipment items and structures. In addition, it must contain sufficiently detailed information to allow identification of the specific safety analyses required to meet the AECB's generic requirements. AECB staff will review the documents that comprise the reference design together with any preliminary work carried out on the safety analyses as part of the review and approval of the applicant's proposed safety analysis program.

3.4 Safety Analysis

This is a process by which the safety consequences of certain hypothesized events, both alone and in various combinations, are analyzed in terms of the release of radioactive material that could occur and its impact on human health. As such, safety analysis is the key activity in the licensing process. The applicant must demonstrate that the predicted consequences of the events required by the AECB to be analysed fall within the criteria set by the AECB. Clearly, the processes of design and safety analysis will interact in an iterative manner and must therefore closely parallel one-another.

In order for AECB staff to assess adequately the results of safety analyses, it will be necessary for them to know the assumptions made, the source of the data used and the analytical techniques used in the calculation models. Regular communciation between the individuals involved in the safety analysis and AECB staff is thus vital. It is equally important that the results and trends of individual analyses be communicated to AECB staff as early as possible, even if on an interim or informal basis. This should minimize the possibility of misunderstanding and 'wasted' effort on the part of the applicant.

AECB staff may require the applicant to verify certain parameter values that form part of the input to safety analyses. Experimental programs may be needed to do this.

3.5 Review and Approval of Safety Analysis Program

Generic requirements for safety analysis have been established by the AECB for various types of nuclear facility. The applicant must apply these to the

facility in question and in doing this, he must prepare a proposed safety analysis program which must be submitted for review and approval by AECB staff. This document will be reviewed together with the reference design and any preliminary safety analyses that have been carried out.

3.6 Detailed Design

The process of detailed design follows on from the establishment of a reference design and includes the preparation of 'design specifications' and 'design descriptions'. In the same way that the design process as a whole interacts iteratively with the safety analysis, so does the detailed design of an individual system interact with that of other systems. In this sense, the detailed design is never totally complete until the end of construction. It is necessary, however, to fix the specification of safety related systems as they relate to the safety analysis as early as possible before construction starts and to ensure that their design incorporates an adequate degree of conservatism.

As part of the design process, the AECB requires the applicant to audit the design from the point of view of exposure of the operating and maintenance staff to radiation. The applicant should prepare estimates of the radiation exposure that will result from foreseen operating procedures, and both routine and non-routine maintenance activities. The intent should be to demonstrate that the station has been designed to reduce such exposure to a level that is "as low as reasonably achievable, economic and social factors taken into account".

The AECB also requires the applicant to demonstrate that the facility design adequately provides for requirements arising from commissioning activities.

testing during both commissioning and normal operation; and, in-service inspection.

3.7 Design Review by AECB Staff

AECB staff will review the documents produced in the process of detailed design in conjunction with the safety analysis program. As design details are produced and modifications made, AECB staff may revise the previously established safety analysis requirements.

This process continues until the design and safety analysis programs have reached the stage such that any additional work that remains to be done in these areas should not result in any further 'significant' modifications. Once this point has been reached, the applicant is in a position to complete the safety analysis required to support the application for a construction approval. Although detailed design work may continue beyond this point in time, the scope of the remaining work will be limited to those areas that will not adversely affect the result of this safety analysis program.

3.8 Construction and Manufacturing Activities Prior to Issue of Construction Approval

Where, as in the case of 'long-lead' items such as a calandria assembly or large pumps, the applicant wishes to have manufacture or construction commence before the issue of a construction approval, the AECB will review and approve each item on a case-by-case basis before either construction starts or the order is placed. It is not intended that all such construction activities or component

ordering be subject to prior AECB approval; only those that might significantly affect the results of the safety analyses. The applicant is required to notify AECB staff of all construction and component manufacturing activities that are scheduled to start before issue of the construction approval and to indicate those which he considers will require AECB approval. For these activities, sufficient information must be provided to enable AECB staff to judge the consequences and acceptability of an 'early' start. As the AECB seeks to minimize these advance approvals, the applicant must also demonstrate the necessity of an 'early' start.

3.9 Quality Assurance Program

The AECB requires the establishment and implementation of an effective quality assurance program that covers the entire life of the facility from initial design through to continuing operation. This program is made up of constituent sub-programs applied to design, procurement, manufacture, construction, commissioning and operation. The applicant is required to establish an overall quality assurance program that ensures both integration of the constituent programs and effective transition from one to the next. The basic principle applied by the AECB is that, before an activity is to start, the applicant must establish and implement the constituent quality assurance program that applies, and that this program must have been reviewed and approved by AECB staff.

During the phase leading up to issue of a construction approval, the applicant must at an early stage submit for AECB approval a report describing the overall quality assurance program together with the details of those constituent programs that must be in-place prior to issue of a construction approval. An outline of the remaining constituent programs must also be included. At the

time of application for a construction approval, the programs for design and 'long-lead' item manufacture must have been implemented and the programs for procurement, manufacture and construction must be in place. Included in the design quality assurance program is the completion by the applicant and their approval by AECB staff of system, component and piping code classification lists. Also required are details of the periodic inspection program covering pressure retaining components and containment structures.

3.10 Staffing and Training Program

The AECB requires the applicant to submit plans and information regarding the staffing and organization throughout the various phases of the project. Design, construction and operations organizations are to be covered. Key positions in each of the organizations should be identified together with the incumbents' qualifications and experience, or the requirements where the position is not filled. General information should include:

- an overall organization chart;

- the overall staffing level anticipated in each group shown in the organization chart for each phase of the project through to mature operation;

- use of contract personnel;

- use of consultants, their qualifications and experience and their organization.

Information on training should include an outline of the program and topics together with a preliminary schedule. The qualification and experience requirements for the training personnel must also be provided.

3.11 Safety Report

The Safety Report for this phase of the licensing process constitutes a comprehensive summary of the results and status of all the activities leading up to the application for a construction approval. It must be supported by the more specific reports and information that it summarizes and each of these documents must be individually identified in a list to be contained in the Safety Report together with the 'issue' or 'revision' number to be considered.

Areas covered by the Safety Report should include:

- a general description of the facility;

- the site, its characteristics and their evaluation;

- the components, structures and systems which make up the facility, their design bases, operating characteristics and safety implications;

- the results of safety analyses, the individual and combined failure modes assumed and a general discussion of the course of each accident together with the data and calculation base;

- staffing and training;

- quality assurance.

The applicant is required to prepare preliminary versions of the Safety Report in the course of the design and to submit these for review by AECB staff starting one year after the letter of intent and continuing with a maximum frequency of once-a-year thereafter.

This will allow advance feedback of concerns and information requirements and facilitate the final review.

3.12 Formal Application for Construction Approval

This step represents formal notification of the AECB by the applicant that he believes all the requirements for a construction approval to have been fulfilled.

The application consists of a letter to the AECB President, together with the Safety Report, requesting issue of a construction approval.

3.13 AECB Staff Review

The duration and complexity of this 'final' review will depend on the extent to which applicant staff have consulted with AECB staff in the course of the preparatory work leading up to the application. In the ideal situation, this step will constitute no more than a formal review of decisions made during the

course of a continuous series of consultations and discussions between AECB and pplicant staff.

Recognizing that, in practice, points of unresolved disagreement may exist, the AECB will consider an application under these conditions with a view to a conditional construction approval. In most cases this will allow construction to proceed with the exception of certain structures or systems. The main consideration in granting such an approval will be the agreement by the applicant on a course of action to resolve the points of contention. The AECB must be satisfied that the action can be completed by the applicant within a reasonable period of time and that an outcome that is unfavourable to the applicant will not result in the need to make significant modifications to other systems or components which would at that time be partially or fully constructed.

4. OPERATING LICENCE

During this phase of the licensing process, the AECB's main concerns are to ensure that the design continues to meet the AECB safety requirements as details develop; to ensure that the facility as constructed matches the design and safety analysis; and, to ensure that the facility can be commissioned and operated in a manner that will meet the AECB safety requirements. This is done by monitoring and reviewing the completion of the detailed design and safety analyses required for an operating licence; by monitoring construction; procurement and manufacturing together with their quality assurance programs; by monitoring the results of commissioning and its quality assurance program to

ensure as far as possible that the results of the safety analyses are corroborated; and, by assuring that all key positions are appropriately staffed. The operating licence is granted in two steps. A provisional licence is issued first which permits the applicant to start the reactor up for the first time, to operate at low power levels and, subject to subsequent AECB staff approval at each stage, permits the reactor power to be increased in specified stages up to full power. A full operating licence may be issued after AECB staff review of full power operation.

4.1 Meeting of AECB and Applicant Staff

This meeting is similar in purpose to those described in sections 2.3 and 3.1. The object is to reach agreement on the manner in which the activities that lead to an operating licence are to be handled. Figure 4 should form the basis of the agenda for this meeting and one outcome should be the preliminary allocation of time estimates and key dates. As with the construction approval phase schematic, it is anticipated that the applicant will draw up a more detailed licensing schedule based on figure 4 which will be incorporated into his own project schedules. This meeting will also provide the opportunity to update the list of documents produced by the applicant on whose distribution the AECB is to be included.

This meeting is not a prerequisite to the start of any of the activities shown on figure 4. It is intended that the meeting be held shortly after the construction licence has been issued.

4.2 Safety Analyses and Completion of Detailed Design

The basis for the required safety analyses and the major part of the analyses themselves will have been completed as part of the application for a construction approval. These analyses will be updated as the remaining detailed design is completed during the construction phase. In addition, the results of various commissioning tests will be used to verify certain of the assumptions and data used in the analyses. Depending on the results of these tests, the AECB may require certain analyses to be refined or additional analyses to be carried out. The design documentation to be submitted to the AECB should include: design manuals, design flowsheets and the overpressure protection report.

4.3 Commissioning Program

Prior to the start of any commissioning activities, the AECB requires the applicant to submit details of his planned commissioning program. The information submitted should:

- describe the philosophies and policies to be followed in commissioning;

- identify the commissioning manuals that are to be prepared and the major steps envisaged in the commissioning of each system;

- identify the tests that are planned, particularly those in support of the safety analyses;

- include an overall commissioning schedule;

- include a description of the commissioning quality assurance program.

AECB staff will review these documents and discuss their comments with applicant staff. The AECB is primarily concerned that adequate tests are planned during commissioning to verify the results of and the assumptions used in certain of the safety analyses.

4.4 Commissioning Activities

The applicant is required to inform AECB staff regularly of commissioning progress. This is done by means of two types of document:

- reports of the results of commissioning tests;

- reports of any unexpected, unusual or significant events that occur during the course of commissioning.

4.5 Operating Policies and Principles

This document is prepared by the applicant and outlines overall constraints that govern the operation of the facility. As such, it not only provides guidance for the preparation of operating procedures, but it also constitutes a commitment by the applicant that will become a condition of his operating

licence. AECB staff will review this document to ensure it contains adequate expression of the safety requirements. Revisions may later prove necessary in the light of commissioning experience.

Operating procedures and the operating manuals when complete are to be submitted for review by AECB staff. Included with this series of documents should be the test program for special safety and safety-support systems together with the preventative maintenance program.

4.6 Radiation Protection

An outline is to be prepared for early approval by AECB staff of the radiation protection measures to be taken as they apply to both the station staff and the public. This should include:

- a statement of the radiation protection policy and an outline of the radiation protection regulations to be established;

- the radiological zones to be established and their rationale;

- special measures to be taken during the commissioning of multi-unit facilities;

- the applicant's radiation protection organization showing the responsibilities of the positions identified;

- plans for internal and external dosimetry of station personnel and visitors, including the records system;

- plans for acquisition of radiation protection equipment including the type and quantity of each item;

- plans for maintenance and testing of instruments and protective equipment;

- description of decontamination facilities for personnel and equipment;

- radioactive waste management plans;

- on-site and off-site environmental monitoring equipment and programs;

- station liquid and gaseous effluent monitoring programs, equipment and associated laboratory facilities;

- the radiation protection training programs to be established;

- a schedule for the preparation and implementation of the above.

4.7 Emergency Plans

The applicant is required to develop detailed plans and procedures to handle emergency situations which may require action on-site and to cooperate with other organizations in the preparation of off-site plans and procedures. Before

preparing the detailed procedures, an outline is to be developed for discussion with and approval by AECB staff. The outline prepared by the applicant should include:

- a description and definition of what are to constitute the emergency situations to be considered;

- definition of the distinction between an on-site and off-site emergency;

- a description of the manner in which an on-site emergency is to be handled;

- the external (other than applicant's on-site organization) organizations to be involved in an off-site emergency;

- plans for periodic emergency drills;

- the role of the applicant's organization during an off-site emergency.

AECB staff cooperate with the external organizations involved in the preparation of an off-site emergency plan to ensure that all the necessary actions have been identified, that the responsibilities for carrying out these actions have been clearly allocated to identifiable individuals or permanently staffed positions and that the actions can be efficiently coordinated during an emergency situation.

4.8 AECB Examinations and Staff Authorization

Shift supervisors and control room operators are required to pass examinations covering knowledge in the areas of 'conventional' process plant operation, nuclear plant operation and radiation protection. Each of the three areas is covered by two examinations: a 'general' examination which covers the topics as they relate to nuclear generating stations in general; and, a 'specific' examination which requires a detailed knowledge of the station to be licensed. 'Specific' examinations must be passed within one year of the individual actively taking up the position for which he is being authorized. Individuals who have previously passed the 'general' examinations when at another station need only pass the 'specific' series.

The AECB must also authorize the senior health physicist, the station manager and the production manager (or their equivalents) although examinations are generally not required.

4.9 Quality Assurance Program

AECB staff start to monitor the quality assurance program for procurement and construction activities that was established during the construction approval phase as soon as it is implemented by the applicant. The program for commissioning must be established by the applicant and submitted for review and approval by AECB staff before the start of commissioning. In addition, an 'operation' or 'in-service' program must also be established and submitted for AECB staff approval prior to issue of a provisional operating licence. It is also necessary for any prerequisites to the in-service quality assurance program, such as 'baseline' measurements, to have been completed.

4.10 Safeguards Program

As a signatory of the Treaty on the Non-Proliferation of Nuclear Weapons and as a result of the subsequent agreement with the International Atomic Energy Agency (IAEA), Canada has certain international safeguards obligations which the applicant must meet. A design description must be prepared by the applicant for submission to the IAEA on which the IAEA then bases its requirements for a safeguards program and specifies the 'facility attachments' required. AECB staff act in a co-ordinative role between the applicant and the IAEA. The AECB uses the safeguards requirements set by the IAEA as a base and may impose additional requirements over and above those of the IAEA.

4.11 Security Plan

The AECB requires the applicant to prepare a security plan which specifies the measures to be taken to maintain the physical security of the facility. The object is to prevent loss, theft or unauthorized use of nuclear material and to provide protection against sabotage. The security plan is to be submitted for review and approval by AECB staff and should include descriptions of:

- the security organization;

- the facility layout including features of the site, buildings and separation of systems that are significant for security;

- access control systems;

- response mechanisms in relation to unauthorized personnel, material or activities;

- security assessment systems, central alarms and communication systems;

- test, inspection and maintenance systems to ensure adequacy of security;

- measures for restricting dissemination of security related information;

- security awareness program.

Sufficient details must be provided to allow evaluation and analysis by AECB staff.

4.12 Safety Report

As with the application for a construction approval, the Safety Report constitutes a comprehensive summary of all the activities leading up to the application for a provisional operating licence together with a list of all the supporting documents. The Safety Report at this stage thus constitutes an updated and necessary expansion of the contents submitted at the construction approval stage together with additional sections covering operating policies and principles, radiation protection and emergency plans.

Preliminary versions of the Safety Report must continue to be submitted for review once-a-year, starting one year after the issue of the construction approval.

4.13 Formal Application for Provisional Operating Licence

The applicant must formally apply for a provisional operating licence by means of a letter to the AECB officer identified as the senior project officer for the facility in question together with the Safety Report.

Because the application for a provisional operating licence is made in advance of the time it is required, certain activities which are required to be complete for the issue of the licence may in fact be in progress. These will mainly consist of commissioning activities. The application must therefore include a list which indentifies all such activities together with any other prerequisites to the issue of the provisional operating licence.

4.14 Completion Assurances

The Board's decision to issue a provisional operating licence will be contingent on the applicant certifying the completion of the prerequisites identified in the application and also providing assurances of a more general nature. These can be classified as follows:

Design Assurance - certification that the 'as-built' design is in accordance with the Safety Report and its additional supporting and reference documentation and that the design has been completed in conformance with the required codes, regulations and standards;

Construction Assurance - certification that construction has been in accordance with the design described above with reference being given to relevant inspection, test or other construction reports; any outstanding construction work must be identified and similar future assurance given;

Commissioning Assurance - certification that the pre-critical (Phase 'A') commissioning has been completed and that future commissioning will be carried out in accordance with this program and published commissioning procedures, AECB staff to be notified of any changes in advance of their implementation;

Prerequisite Completion - certification that the prerequisites identified in the application for a provisional operating licence has been completed.

The provisional operating licence will come into effect once the applicant has provided written certification of all the above and when these assurances have been accepted in writing by the AECB staff member designated as senior project officer for the facility and who would normally be resident at the site.

4.15 Application to Acquire Fuel and Heavy Water

Separate applications should be made for licences to acquire fuel and heavy water. Each application should include information regarding the method of acquisition, transportation, on-site storage and security precautions. The fuel application should also include information on the fuel composition and its design and, where the fuel is enriched, information on criticality safety. These licences becomes redundant once the provisional operating licence is issued.

4.16 Application to Load Fuel and Heavy Water

The applicant must apply in writing to the AECB for approval to load fuel or heavy water. Separate applications should be made for each loading operation, e.g., fuel, booster fuel, moderator and heat transport water. Each application must contain an overall schedule of all the loading operations together with details of the special precautions to be taken in conjunction with and subsequent to the loading operating in question.

4.17 Provisional Operating Licence

This licence is issued by the Board and comes into effect once AECB site-based staff have verified completion of the prerequisites. The licence authorizes the applicant to start the reactor up for the first time and to run low power tests and measurements (Phase 'B' commissioning). Operation at a higher power level will be contingent on the review by AECB staff of the results of these low power commissioning activities and tests. AECB site-based staff will meet with the applicant's operations personnel and agree on any actions or prerequisities to be completed before a power increase is authorized. These prerequisites, together with the planned stages in which reactor power is to be increased, are to be incorporated into the commissioning schedule. No increase in power from one stage to the next is permitted without the written authorization of the site-based AECB staff.

4.18 Full Operating Licence

A full operating licence may be issued by the Board on the recommendation of AECB staff when all outstanding safety-related matters have been satisfactorily cleared and continuous full power generation has been demonstrated. For a multi-unit facility, this licence will be for all the component units. The full licence is issued for a limited period of time, before the end of which, the licensee must apply for renewal.