



Nuclear Power Corporation of India Ltd.
(A Govt. of India Enterprise)

HAND BOOK ON SITE SELECTION PROCESS

M.N. Ray
Advisor (Civil)



*Mithivirdi Coast
during low tide.*



*Mithivirdi Coast
during low tide.*



*Site Selection
Team with
Gujarat Power
Officials.*



HAND BOOK ON SITE SELECTION PROCESS



NUCLEAR POWER CORPORATION OF INDIA LIMITED
(A Government of India Enterprise)

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FOREWORD



Government of India has been appointing Site Selection Committee to evaluate the sites for setting up of nuclear power stations in the country from time to time. This activity in the past when the nuclear power programme was modest was rather limited. With the entry of nuclear power in the commercial

domain and the maturity exhibited in terms of all aspects of nuclear fuel cycle, the nuclear power programme has seen a quantum jump. In addition, the decision of Nuclear Suppliers Group to have international nuclear commerce with India further opens up the possibility of large capacity addition based on foreign co-operation. India has followed a path of closed fuel cycle implying among others, advantages, multiplier effect of the capacity addition through re-processing of used fuel. While the nuclear power programme of reaching about 60000 MW in next two decades or so is doable, exploitation of full potential of country's resources, would involve a much larger programme beyond 2030 through variety of reactor systems. These reactors and the associated fuel cycle facilities would need multiple sites. Site selection process is the first multidisciplinary activity in the

process of setting up of nuclear power stations. While considerable documentation in terms of codes and guides is available for evaluation of sites, this handbook would be a very useful document for large number of stake holders involved in site selection process for future generations. I commend the work done by the Member Secretary, Standing Site Selection Committee.

Mumbai
26th January 2010

A handwritten signature in black ink, appearing to read 'S.K. Jain', with a long horizontal stroke extending to the right.

S.K.Jain
Chairman SSSC
Chairman &
Managing Director
NPCIL and BHAVINI

PREFACE



The Standing Site Selection Committee for evaluation of sites with Chairman & Managing Director, Nuclear Power Corporation of India Limited and Bharatiya Nabhikiya Vidyut Nigam Limited as Chairman of Standing Site Selection Committee has evaluated sites offered by the State Governments in coastal locations as well as inland sites. The requirement of codes and guides has to be explained to large number of agencies in the State Government and other stakeholders in the process of site evaluation. The Member-Secretary, Standing Site Selection Committee has put in considerable efforts in collating the data and issuing the same in the form of handbook. The entire process from notification of constitution of the Standing Site Selection Committee, appointment of sub-committees, communication with the State Governments, ground work to be done by the sub-committees of the Standing Site Selection Committee and finalisation of the Site Evaluation Committee report has been very comprehensively covered in this handbook. I am sure larger number of people who would be involved in the Site Selection process at Nuclear Power Corporation of India Limited & other units of Department of Atomic Energy and officials of the Revenue & Power Department of the various State Governments would find this handbook quite useful.

Mumbai
26th January 2010

A handwritten signature in black ink, appearing to read 'S. Thakur', written in a cursive style.

S.THAKUR
MEMBER
SSSC & EX Dir (CP & CC)

PREAMBLE

In the very first Decade after Independence, Government of India had planned to establish Nuclear Power Project across the country. The concept of feasibility of NPP in those days was that the Nuclear Power Station will be viable beyond a distance of 700 km from the coal belt. Accordingly the first project team was formed under the Chairmanship of Sh. M. N. Chakravarti in 1959 for selection of Site in the Western region. This team selected sites at Tarapur (220 MWe BWR, TAPS 1 & 2) and Kakrapar (220 MWe PHWR, KAPS 1 & 2) for location of NPPs.

Subsequently Department of Atomic Energy constituted the first Site Selection Committee (SSC) in 1961 under the Chairmanship of Sh. M Hayath, Ex. Chairman of CWPC to investigate sites in Southern as well as Northern regions of India. This committee had recommended various sites, out of which the following sites were selected by Government of India for establishment of Nuclear Power Station.

Northern Region: 1. Rawatbhata in Rajasthan (220 MWe PHWR for Raps 1 & 2)

Southern Region: 2. Kalpakkam in Tamilnadu (220 MWe PHWR, MAPS 1 & 2)

Later on Chakravarti Committee appointed by DAE investigated Sites for establishment of NPPs in Northern, Western and Southern Regions during 1972 – 1973. This work was subsequently continued under the Chairmanship of Sh. V. R. Vengurlekar for Western (Goa) and Southern Region during 1975. The selected sites are as follows.

Northern Region: 1. Narora in Uttar Pradesh (2 X 220 MWe PHWR)
2. Rawatbhata (Expansion 2 X 220 MWe)

Southern Region: 1. Kalpakkam in Tamilnadu.
2. Kudankulam in Tamilnadu.

In the year 1981 DAE constituted a new SSC under the Chairmanship of Sh. S. L. Kati. This committee was reconstituted in 1983 under the Chairmanship of Dr. M. R. Srinivasan on carrying out overall assessment of sites in all the four electricity regions (Southern, Northern, Western & Eastern) in relation to the then projected target of 10,000 MWe by

the year 2000 AD contemplated by the Government at that time. This committee continued functioning up to 1986 and selected sites are as follows.

- Southern Region:
1. Kaiga in Karnataka.
 2. Kudankulam in Tamilnadu (500 MWe FBR/PHWR)
 3. Kalpakkam in Tamilnadu (500 MWe PFBR)
- Northern Region:
1. Rawatbhata in Rajasthan
 2. Narora in Uttar Pradesh
 3. Patran in Punjab
 4. Kumharia in Haryana
 5. Mahi-Banswara in Rajasthan
 6. Matatila in Uttar Pradesh
- Western Region:
1. Tarapur in Maharashtra
 2. Kakrapar in Gujarat
 3. Ujani in Maharashtra
 4. Rajapur in Madhya Pradesh
 5. Jaitapur in Maharashtra
 6. Bargi in Madhya Pradesh.

Later ,the DAE constituted a Technical Committee under the chairmanship of Sh S.Krishnan to explore future sites in kerala and Andhra Pradesh.The site selected were Peringome(Kerala) and Nagarjunsagar and Kovvada (A.P).The committee report was reviewed by another SSC in 1991 under the chairmanship of Sh S.L.Kati and subsequently by Sh S.K.Chatterjee,who submitted their report in 1994.

In the year 1998 a new Site Selection Committee was constituted by the Secretary DAE to recommend a panel of Sites for establishing indigenous PHWRs, FBRs and imported LWRs under the Chairmanship of Dr. Y. S. R. Prasad, CMD of NPCIL during that period. This committee submitted its interim report in 4 parts for different electricity zones.

The Report No. 1: “Additional Potential of existing Sites for location of Nuclear Power Plants” which explored additional potential of existing Sites (Narora, Kakrapar, Kudankulam, Rawatbhata & Kaiga) for location of NPP.

The Report No. 2: “Assessment of Sites for locating Nuclear Power Plants in Southern Electricity Region” examined suitability of Sites already identified by earlier Committees in the following sites Kovvada (Andhra Pradesh), Kaiga (Karnataka), Kalpakkam (Tamilnadu), Kudankulam (Tamilnadu)

Report No. 3: “Assessment of Sites for locating Nuclear Power Plants in Western Electricity Region” recommended the following new Sites in addition to the existing sites in the region. The new sites were Bargi & Rajapur (M. P), Jaitapur (Maharashtra). It also covered existing sites of Kakrapar (Gujarat) and Tarapur (Maharashtra).

SSC (1998) submitted a report titled “ Interim Report on overall assessment of sites for locating Nuclear Power Plants” which identified sites for launching NPP planned to commence either construction or pre-project activities in 10th Plan.

Report No. 4: “Assessment of Sites for locating Nuclear Power Plants in Northern Electricity Region” – 2003 recommended new sites in Northern Electricity Region such as Kumariya (Haryana), Patran (Punjab), Mahi-Banswara (Rajasthan) and expansion in the two existing sites. Rawatbhata (Rajasthan), Narora (Uttar Pradesh).

Constitution of the present SSC – 2005 after a gap of 2 years from the submission of the previous committee report, was initiated by Secretary DAE Government of India in the backdrop of Civil Nuclear Corporation of India with the International Community. The focus this time was to set up power station in the coastal regions of all the coastal states which later on was extended to cover the potential of Inland Sites if the State Governments of the respective states desired to have a Nuclear Power

Station in their States. The SSC – 2005 was re-designated as Standing Site Selection Committee (SSSC – 2008) by Secretary DAE to examine the potential of all types of sites (coastal & inland) in a continuous mode and to recommend sites on regular basis. The SSC – 2005 and SSSC – 2008 had recommended number of coastal & inland sites which are pictorially shown in Figure 3. Therefore these reports mentioned in the preamble can be referred while using this handbook.

Author of this Hand Book is indeed grateful to all his colleagues and superiors who had contributed immensely for drafting figures, drawings etc and reviewing this Hand Book to see that it can be brought to a good shape.

1. Introduction

Siting, design, construction, operation and de-commissioning are the five major stages during the life of a nuclear power plant. While considering a site for locating a multi unit nuclear power plant park, few important criteria are to be satisfied. Unlike other industrial installation, these criteria are absolutely to be met for nuclear plant siting. Siting process of selecting a suitable site for nuclear plant involves two stages.

The first stage being initiation of demand of power in the region where the candidate site is located. In the present scenario, Government of India has given the Department of Atomic Energy (DAE) an ambitious target of Nuclear Power Generation of 63Gwe by the year 2030. By the year 2009 Nuclear Power corporation India Ltd (NPCIL), the only authorized company of Department of Atomic energy (DAE) had established 18 operating Reactors of total capacity 4340 Mwe and 2 more reactors (440Mwe) are ready for operation. In addition, 2x1000 Mwe Reactors at Kudankulam Tamilnadu are in advance stage of construction awaiting criticality by the year 2010. NPCIL is planning to take up construction work at Jaitapur (Maharashtra) 2x1650Mwe, Kudankulam (2X1000 MW) 2x700Mwe each at Rajasthan unit 7&8, Kakrapar unit 3&4 by 2010/11. Therefore still there remains a wide gap between target and achievement so far in spite of these additions of units. The second stage of Siting which is mainly Site selection process starts with the notification by the Government of India to search

for new sites or select a new site adjacent to the existing operating units.

This stage is initiated by GOI through notification for constituting a site selection committee (SSC) or issuing office memorandum in partial modification to continue the existing SSC to function for another term.

In this stage, a report is prepared on the basis of site specific data for one or more candidate sites which after review in the SSC is approved for further submission to Government. Intention to publish this HandBook is to streamline the entire process of siting in a structured manner so that uniformity exists in all reports in the years to come. This hand book is meant for identifying steps in the entire process of siting and their sequence of events and referring relevant codes to be followed.

2. Notification for Constitution of Site Selection Committee

The Secretary Department of Atomic Energy, Government of India appoints a Site selection Committee(SSC) with the objective of establishing Nuclear Power Plant in India which shall function up to its Design Life safely abiding all the regulations of Atomic Energy Regulatory Board and other Regulatory Authority in the Ministry of Environment & Forests. This Committee consists of members with excellent academic and regulatory back ground and drawn from various Central Government Departments who are responsible for setting up various regulation related to Environment and Forestry(M.O.E.F), Electric Power (CEA), Health and Safety(BARC). Members are also drawn from esteemed organization working in the field of Nuclear Engineering such as Indira Gandhi Center of Atomic Research (IGCAR), Atomic Minerals Directorate of Exploration and Research.

In addition, one member is appointed from Atomic Energy Regulatory Board(AERB) who guides the entire process of selection of site in regards to acceptance criteria already established by AERB.

Lastly, two additional members are selected from the Utility NPCIL considering their expertise in all aspect of Planning, Designing, Construction and Operation of Nuclear Power plants in the country. One of the NPCIL member functions as Member Secretary of the

committee. The Chairman of Site Selection Committee has so far been from the utility in this case Nuclear Power Corporation India td. Typical Office Memorandum from Department of Atomic Energy is placed as Annex-1.

3. Appointment of Sub Committees.

The Chairman (SSC) based on the mandate of the Government , appoints one or more technical sub committees who should review all the site related data necessary for selecting the site for the above purpose. These sub committees complete the detailed interaction with State Governments and if necessary are required to visit the site for confirmation of site data.

4. Communication from Chairman SSC to States.

The Chairman (SSC) writes to the various state governments to appoint a nodal officer who will interact with the Member Secretary of SSC (also a member of the technical subcommittee) for various site related data such as exact location of the site, population, availability of fresh water/cooling water etc. Generally, the Managing Director of Respective State Power Development Corporation is nominated by the State Chief Secretary/Principal Secretary(power). A copy of the Preliminary information proforma is also sent to respective nodal officer for submission to Member Secretary(SSC).

5. Ground work to be done by Sub Committee

Convenor of the Sub committee calls for 1st meeting of the subcommittee wherein it is decided that the entire Site Selection work should be carried out in conformity with AERB SAFETY CODE(AERB/SC/S)[1].

Annexure –A of this code provides acceptance/Rejection criteria during preliminary stage of site selection and also suggests rejection standard against few important criteria ,e.g.

Distance of site from capable fault < 5KM

Distance from Small, Major and Military airfield < 5, 8, 15KM respectively.

Parallely, Sub Committee collects all possible site related data available in the official web site of the respective state government, e.g.; Data on Geography, Demography, Metrology, Infrastructure around the candidate site, Population and their habitat. Member Secretary sends the nodal officer a Preliminary information proforma (Annex-2) which states should fill up and sent to the SSC for review. Based on the submission and review by the subcommittee, a site visit is arranged to ascertain these details. During the site visit, subcommittee goes around the site along with the Nodal officer of the state and verify the following facts.

- Wheather Screening Distance Values (SDV) mentioned in the Annexure –A is met.
- General Geology of the site, whether foundation on marine soil.
- Extreme flood level observed by some old persons of the community.
- Any cyclonic devastation local people experienced in last 30 years.
- Availability of Cooling/Fresh water supply in the area.
- Population existing in the exclusion zone area.

All these site related data collected during the visit is recorded through a memory note and used for preparation of the report.

6. Objectives in siting NPP from nuclear safety point of view and criteria for fulfillment.

To ensure that site plant interaction will not introduce any radiological risk of an unacceptable magnitude.

Radiological risk due to external events should not exceed the range of similar risk due to accidents of internal origin.

Possible radiological impact of a NPP on the environment should be acceptably low for normal operation and under accident condition and satisfies stipulated criteria for radiological safety.

1. Acceptance/Rejection Criteria During Preliminary stage

Site should not fall in Seismic Zone V as per IS 1893 Classification.

- Within 5 km from site boundary, no Capable fault should exist.
- Distance from small airfield > 5KM.
- Distance from Major airfield > 8KM.
- Distance from Military airfield > 1 5KM.
- Distance from Military Station > 10KM.
- Distance from Architectural Monuments > 5KM.
- Site Grade Level should be at least Safe Grade Elevation estimated based on highest flood level due to rain, dam break study, flooding due to storm surge/tsunami and highest tide in the sea.
- Fresh water requirements for plant operation.
- Availability of sufficient quantity of Cooling water near the site for operation and during shutdown cooling.

2. Important Desirable Criteria for selection of site

- Population density should be less than 2/3 of state average population density.
- Population within 5 km (sterilised zone) should be less than 20000 persons.
- Distance of population centres > 10000 persons should be at least more than 10km.
- Distance of large population centres > 100000 persons should be more than 30km.
- Terrain should be reasonably flat.
- Location of port/dry port should be away by 5 km.

7. Important Reports to be Generated

A preliminary seismotectonic status report is to be prepared by an Expert agency such as Geological Survey of India(G.S.I), Atomic Minerals Exploration Directorate(AMDER), National Geophysical Research Institutes (NGRI), all in Hyderabad, National Institutes of

Rock Mechanics(NIRM) in Mysore etc to locate all the capable faults /lineaments within a radius of 300km from available literature study, satellite imageries, SEISAT of G.S.I,etc.The contents of the report are as below.

- Seismotectonic and Lineament Map of an area of Radius 300km.
- Details of Lineaments and Faults in a tabular form showing length of fault , shortest distance from site.
- Recorded Seismic events around the proposed site of radius 300km, their epicenter(lat,long).
- Geotechnical investigation report based on drilling of at least 6 Boreholes each up to a depth of 60-100m.

8. Composite report of selection of site by sub committee of SSC

- (a) Sub committee prepares a site specific assesment report comprising of
1. State Govt submission of site data in the profoma sent by SSC.
 2. Seismotectonic assessment by GSI/AMD/NGRI/NIRM.
 3. Geotechnical Report based on drilling of 6 bore holes highlighting assessment of Safe Bearing Capacity of soil at foundation level. In addition, Factor of safety against Liquefaction is also estimated if such possibility exists at site.
- (b) Ecosensitivity of the site from Breeding of Marin species.
- (c) Final Report on Overall Assessment of site

The Sub Committee's Assessment Report is circulated among all the SSC members for comments.

9. Finalisation of Site Selection Report

- Once the above reports for all sites are cleared by all the members then a final report comprising of all the inland and

coastal site is prepared and placed before the Full site selection committee meeting for acceptance.

- Upon acceptance by the committee, the report is bound for submission to Dept of Atomic Energy.

10. Structure of the Typical Site Selection Report

The Front cover: Official Emblem of Government of India at the top 2" from the top edge. At the centre of cover page, Title of the Report. At the bottom 3 " from the edge, report no and date of issue. Further ¾" below name of the site selection committee with the year of constitution, Govt of India, Department of Atomic Energy.

Foreword: Signed by either Chairman of SSSC or if sub committee report then by members of the subcommittee.

Executive Summary: A total gist of the Report indicating the conclusion.

1.0 Introduction

- 1.1 General
- 1.2 Scope of the report
- 1.3 Structure of the report
- 1.4 Coastal Sites
- 1.5 Inland sites

2.0 Bases of assessments of Prospective Sites.

- 2.1 Area requirement
- 2.2 Safety Considerations in Engineerability
- 2.3 Off Site Emergency Planning
- 2.4 Other Considerations.

3.0 Details of Proposal from States

- 3.1 General
- 3.2 Geography and Demography
- 3.3 Power Availability in the State
- 3.4 Site Related Data

4.0 Assessment of Proposed Sites

- 4.1 Site Location
- 4.2 General Environment & Screening Distance Value
- 4.3 Geology & Seismotectonic Assessment of the Site
- 4.4 Soil / Rock Strata, Slope instability, Subsidence.
- 4.5 Flooding Hazard and Grade Elevation
- 4.6 Population
- 4.7 Sea Bed / Intake Structure
- 4.8 Connectivity
- 4.9 Availability of Construction Facilities (Electric Power, Water and Construction Material)
- 4.10 Other Observations
- 4.11 Conclusions
- 4.12 Recommendation.
- 4.13 References.
- 4.14 Annexure and Enclosures.

11. Contents of important paragraphs of site selection committee report

- **Forward:**

In the forward page, The Chairman Site Selection Committee will present the titled report as a committee work after stating the event of constitution of SSC by Secretary GOI Department of Atomic Energy and constitution of other sub committees. He will deliberate on the scope of the committee assigned in GOI office memorandum. A brief account of the work by various subcommittees and the main committee will be illustrated.

- **Executive Summary:**

Executive summary should be written after the report is complete in all respect. The first draft report with executive summary can be circulated to the members of the site selection committee(SSC) for their comments.

- **1st and 2nd para:**

- (a) Brief details of constitution of SSC by Government of India and brief scope of responsibilities of SSC. In case the present committee is reviewing any site selection report already submitted to DAE then a brief count of the old report should also be explained.
- (b) Brief details of communications from state government about their expression of need for additional power through nuclear route.

- **3rd para:**

- (a) Present power situation in the respective state and the region, peak demand, future growth in demand in the state as well as region.

- **4th para & 5th para:**

Brief of work done by various sub committees about the site specific details, conclusion on the Screening Distance Values(SDV) about the specific site as to whether these values are meeting the regulatory requirements.

- **6th para:**

In case of a composite report comprising of a bunch of sites, a detailed comparison should be done to rank various sites region wise. Various recommended sites should clearly be brought in order of merits.

- **Introduction:**

A brief summary will be presented about formation of SSC, mandate given by the government. All earlier committee report connected to the candidate sites should be tabulated and discussed in this section including their report no date of issue. This section should also contain scope and structure of the report.

- **Bases for assessment of prospective sites.**

Three aspects are important in selection of sites for nuclear power plants (NPP).

- (a) Engineerability
- (b) Off site emergency planning
- (c) Electrical power demand supply status of the Region.

- **Area Requirement:**

This paragraph should be written based on the type of reactors that are going to be located in that site and number of units proposed. Additional area should be earmarked for any co-locating facilities that are going to come in future in that site. Two possible layouts of multi-unit NPP for coastal as well as inland sites are shown as Fig-1 & 2 respectively. At present the exclusion zone norms for any reactor in India is 1.5 KM radius from the reactor centre. While demarcating the area for multi-unit NPP, certain minimum distance of the Main plant boundary (MPB) from Exclusion zone boundary (EZB) is to be maintained. Similarly, the same logic is applicable for a distance between MPB and Operating Island boundary (OIB).

- **Safety Consideration:**

Safety consideration will be elaborated in this chapter referring to various codes and guides published by AERB, IAEA and other international bodies while estimating the three above bases of assessment for candidate sites.

- **Assessment of candidate site**

A detailed assessment of the candidate site should contain the following important sub-headings.

- (a) **Site characteristics:** Geography, Demography of the candidate site. Any site specific report prepared for selection of site by any sub-committee also should be referred in this section.
- (b) **Metrology:** Average, maximum and minimum atmospheric temperature (range) during the year, maximum rainfall in a day and total rainfall in a year. Relative humidity (max & min) throughout

the year. These values shall be estimated based on minimum 30 years data to be collected from Indian Metrology Department (IMD). Similarly, severe wind and extreme wind shall be assessed based on the wind data of nearby met data center for a period of at least 30 years.

- (c) **Screening Distance Value:** SDV in a tabular form against regulatory requirement.
- (d) **Seismotectonic status:** The most important of all SDV's is seismotectonic environment of the candidate site. A site specific seismotectonic report is to be prepared using the services of an expert geologist and a seismologist. This report will cover all faults and lineaments that are existing within a radius of 300km around the site in addition to all the seismic events recorded and postulated against these faults/lineaments. Any neotectonic activity in the area around the site should be covered in this report.
- (e) **Sub Surface strata:** A detailed sub surface soil/rock condition should be evaluated based on drilling of at least 6-8 bore holes to a depth up to 100 metre. If the strata condition is liquefiable, then safety factor against liquefaction is to be assessed and included in the report. It should be evaluated that site is engineer able from the point of view of foundation.
- (f) **Flooding Hazard and safe grade elevation:** A first order assessment in this regard should be done by a subcommittee to quantify the safe grade elevation based on topographic maps, past record of floods in that area.
- (g) **Population:** Authentic population data should be collected from the state government in the prescribed proforma already mentioned in section 4 above.
- (h) **Intake /Outfall structure:** Based on the location of the candidate site a possibility of suitable intake outfall scheme should be discussed in this section. In case of coastal site, based on High tide /Low tide level approximate distance of intake/outfall system from the pumphouse/protection bund should be indicated in this section of the report. Any further study required should also be suggested in section.

- (i) **Availability of construction facility:** Construction power, startup and commissioning power availability should be discussed in this section. Similarly, water and other construction material availability should be highlighted appropriately.
- (j) **Other observation:** In this section, Industrial facilities available around the candidate site ,power evacuation system, Ecosensitivity and details of forest land within exclusion zone should be discussed in the report.
- (k) **Over Dimensional Consignment:** Over Dimensional Consignment (ODC) transportation should be reviewed for the site in a great details. All modes of transportation possibilities should be explored to see economic viability of the site in this regard.

12. Conclusion and Recommendation:

This section should clearly suggest outcome of the committee's review about the possibility of locating 6-8 PWR units in a coastal site and 4-6 x700 MWe PHWR units in an inland site. Recommendation can be given subject to various conditions which shall be considered at stage of site evaluation.

13. Power Supply status of the Country:

Power supply status of the country including the affected regions should be explained in the composite report which is prepared for a number of sites existing in different regions. The same should be elaborated for the specific region if the report is for one or more sites in a specific region.

This section should discuss actual power position at the end current plan period.

Details of the National /Regional Grid existing during the period of reporting and future planning for upgradation of these grids.

5	AERB/SG/S-5	Models for Radioactive Dose Computation Methodologies from Radioactivity concentrations in Environment
6	AERB/SG/S-6A	Design Basis Floods for Nuclear Power Plants on Inland Sites
7	AERB/SG/S-6B	Design Basis Floods for Nuclear Power Plants at Coastal Sites
8	AERB/SG/S-7	Man-Inducted Events and Establishment of Design Basis Events (Draft)
9	AERB/SG/S-8	Influence of Site Parameters on Emergency Preparedness
10	AERB/SG/S-9	Population Distribution and its Analysis in Relation to Siting of Nuclear Power Plants
11	AERB/SG/S-10	Quality Assurance in Siting
12	AERB/SG/S-11	Seismic Studies and Design Basis Ground Motion for Nuclear Power Plant Sites
13	50-SG-S9-IAEA Safety Guides	Site survey for Nuclear Power Plants

16. Annexure and Enclosures:

The numbering system can be adopted based on serial order of appearance in the text or it can be chapter wise which is generated as the text portion keeps generated.

17. List of Reference Documents :

The list should include mainly various reports and study reports connected to earlier site selection committees, AERB/IAEA safety guides and standards referred in the site selection report. Certain voluminous reports referred can also be part of this list.

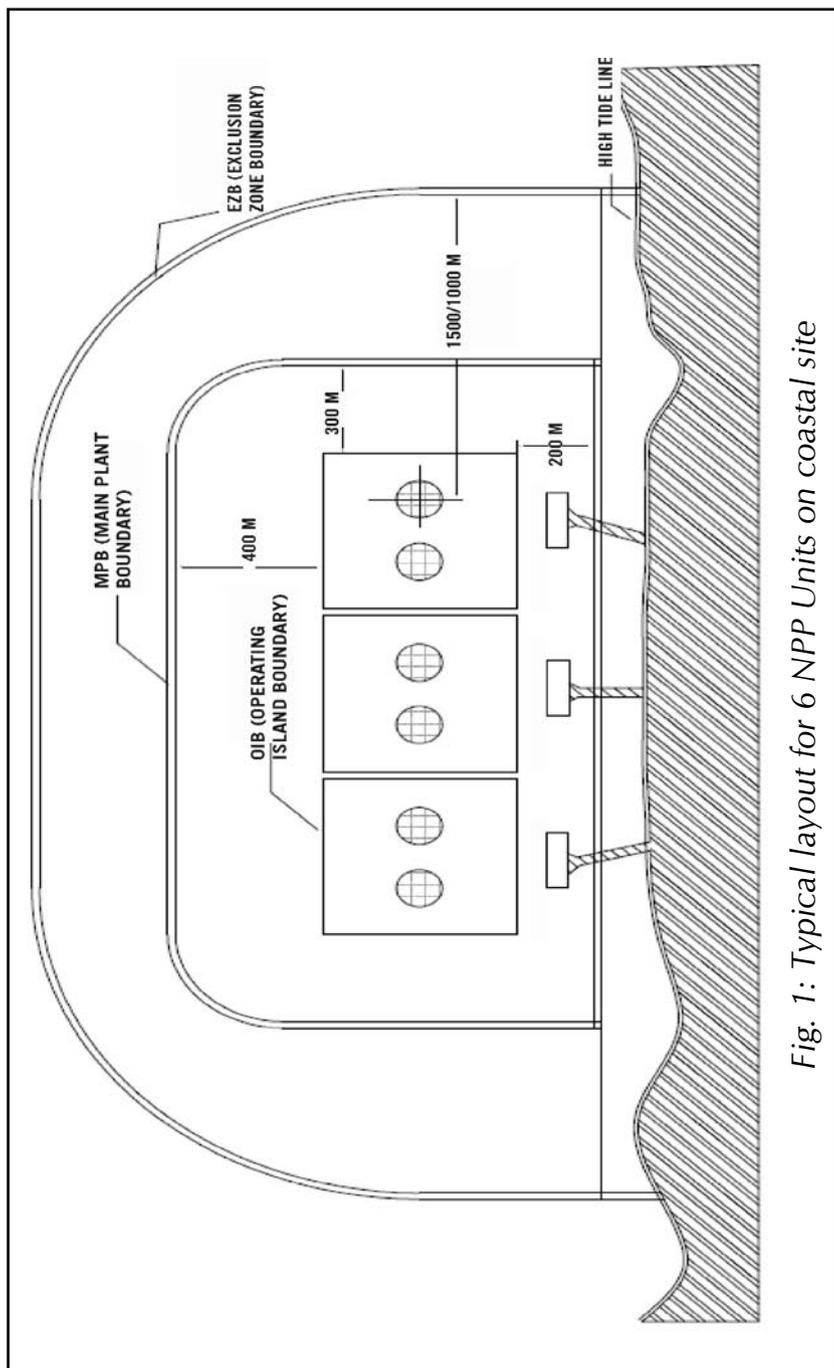


Fig. 1: Typical layout for 6 NPP Units on coastal site

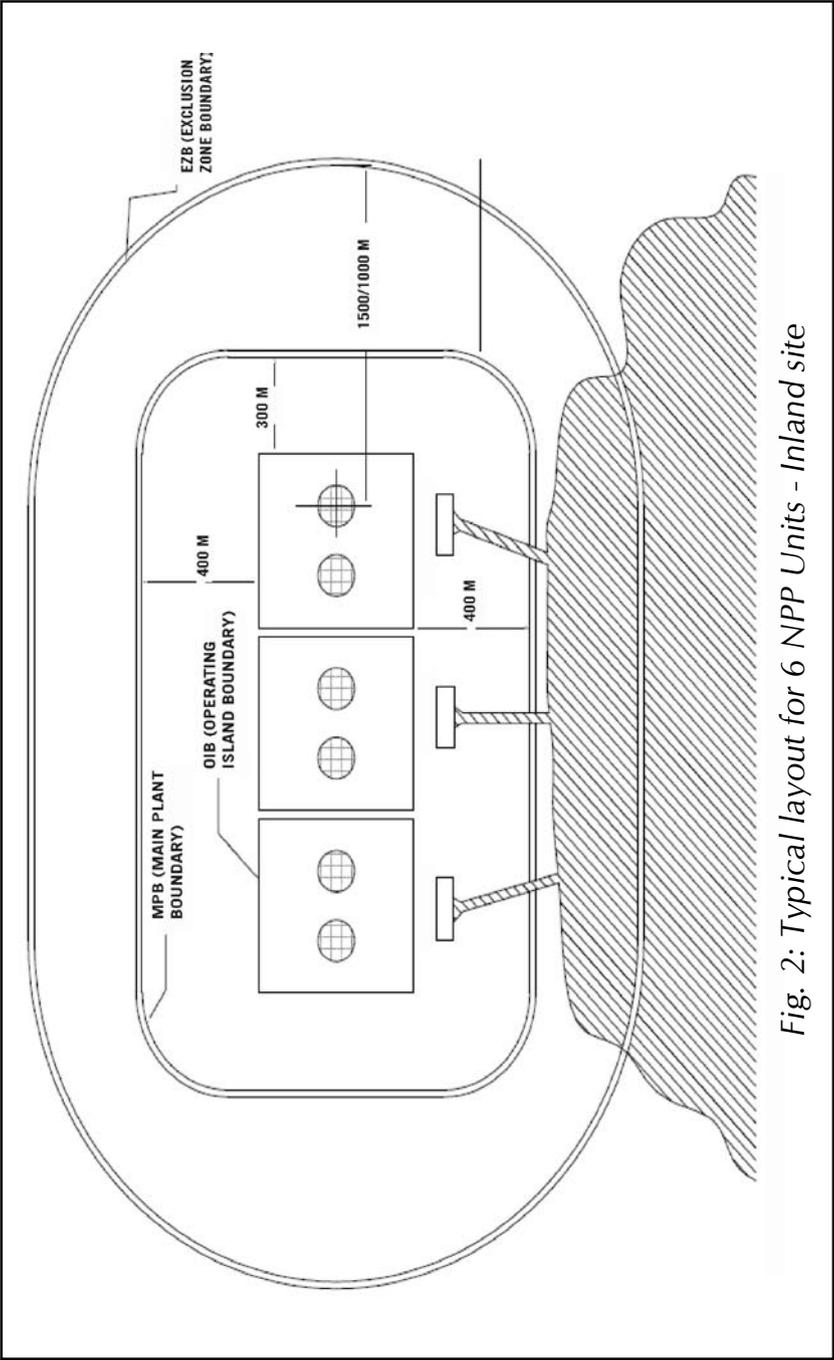
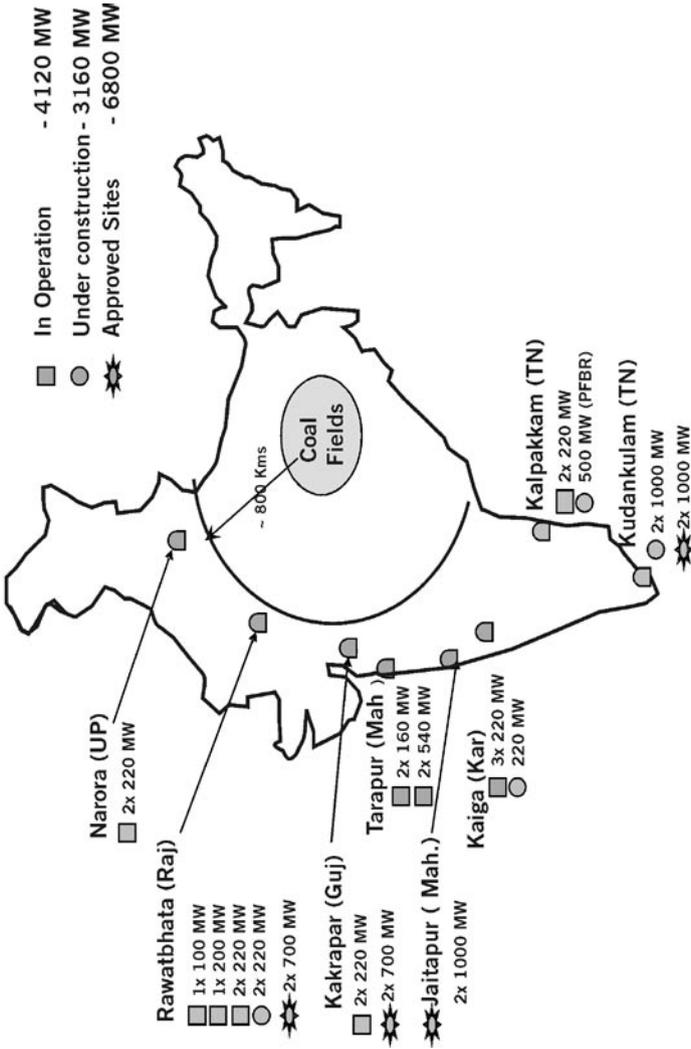


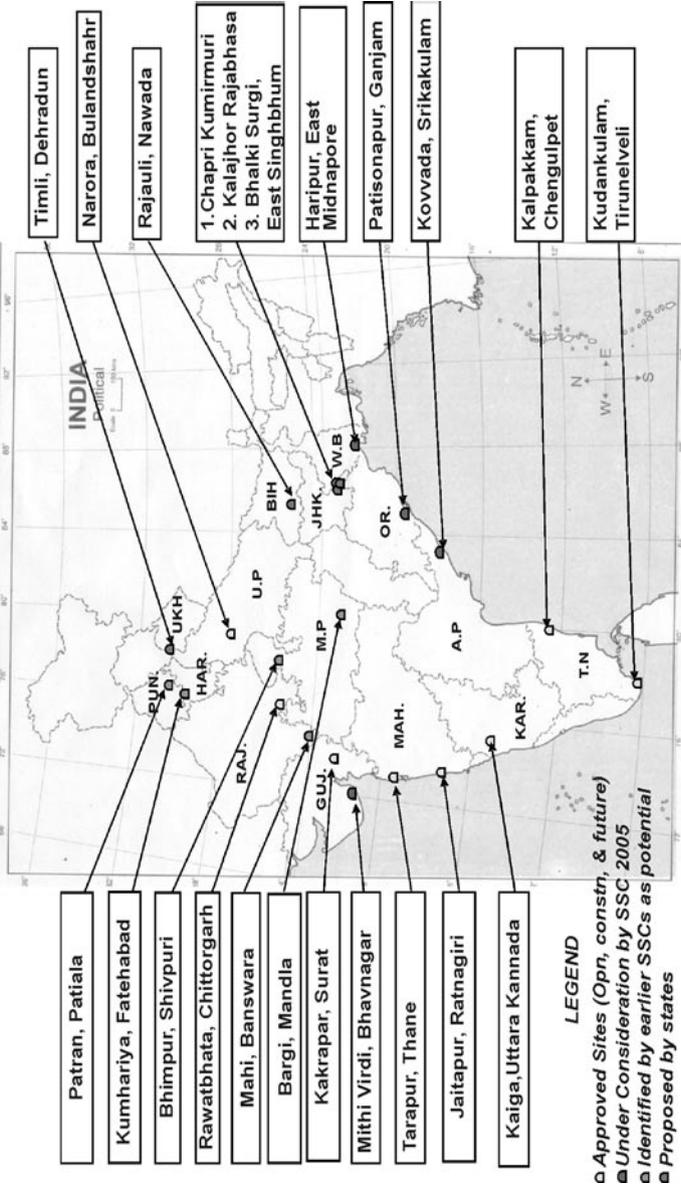
Fig. 2: Typical layout for 6 NPP Units - Inland site

Nuclear Power Plants in India



Nuclear Power Plants under operation, construction and approved by Govt of India.

NUCLEAR POWER PLANTS - SITES



Nuclear Power Plants recommended by earlier SSC's, SSC-2005 & SSSC-2008 and Sites proposed by States.

**Government of India
Department of Atomic Energy
Power Section**

Annexure 1

No. 1/5(3)2005-Power/610

Anushakti Bhavan,
C.S.M. Marg,
Mumbai – 400 001.
September 06, 2005.

OFFICE MEMORANDUM

Subject: Committee for selection of site for future nuclear power stations

A Site Selection Committee is hereby constituted with the following composition:

1. Chairman & Managing Director : Chairman
Nuclear Power Corporation of India Limited
Mumbai.
2. Representative from Central Electricity : Member
Authority, New Delhi.
3. Representative from Union Ministry of : Member
Environment & Forest, New Delhi
4. Representative from Atomic Energy : Member
Regulatory Board, Mumbai
5. Director, Reactor Group : Member
Indira Gandhi Centre for Atomic Research
Kalpakkam
6. Director, Health Safety & Environment Group : Member
Bhabha Atomic Research Centre, Mumbai
7. Director, Atomic Minerals Director for : Member
Exploration & Research, Hyderabad

8. Executive Director (Corporate Planning) : Member
Nuclear Power Corporation of India Limited
Mumbai
9. Shri M.N.Ray, ACE : Member
Nuclear Power Corporation of India Limited
Mumbai

The committee may consult such experts and co-opt members as it considers necessary on specific problems.

2. The terms of the reference of the Committee will be to recommend a panel of Coastal sites for setting up of nuclear power stations of 4000 to 6000 MWe, on the basis of electricity regions in the country and to indicate the order of suitability of site selected in each electricity region. In making its recommendations, the Committee will apply the following criteria and guidelines in selection of sites:
 - The code of practices for selection of site published by Atomic Energy Regulatory Board.
 - Guidelines of the Union Ministry of Environment & Forests.
 - Technical and engineering considerations in selection of sites.
 - Electricity demand, supply, alternative fuel options, transmission
 - Consideration based on inputs from Central Electricity Authority.
3. The Committee will consider the following for the above purpose:
 - i. The sites recommended earlier by the previous Site Selection Committee and review their position in the light of changes that may have taken place in the intervening period.
 - ii. New Sites.

The Committee will contact and co-ordinate with organizations nominated by the State Governments in each State for the purpose of site survey and investigations.

4. The Committee will submit its recommendations by December 31, 2005.

(Anil Kakodkar)
Chairman, AEC

To,

1. Chairman & Managing Director,
Nuclear Power Corporation of India Ltd., Mumbai.
2. Chairman, Central Electricity Authority,
New Delhi. With a request
to kindly
3. Secretary, Ministry of Environment &
Forests, New Delhi. nominate
their Represen
4. Chairman, Atomic Energy Regulatory Board
Niyamak Bhavan, Anushaktinagar,
Mumbai – 400 094 tative to
serve in the
Committee
5. Director, Reactor Group Indira Gandhi Centre for Atomic
Research, Kalpakkam
6. Director, Health, Safety & Environment Group,
Bhabha Atomic Research Centre, Mumbai – 400 085
7. Director, Atomic Mineral Directorate for Exploration &
Research, Hyderabad
8. Executive Director (Corporate Planning) Nuclear Power
Corporation of India Limited, Mumbai
9. Shri M. N. Ray, Additional Chief Engineer, Nuclear Power
Corporation of India Limited, Mumbai

**PRELIMINARY INFORMATION ON SITES
FOR NUCLEAR PLANTS
(to be filled in by the State Government)**

Annexure 2

1. LOCATION – NAME :
 LATITUDE & LONGITUDE :
 STATE/DISRICT/TALUKA/VILLAGE :

2. ACCESS :
 ACCESSIBILITY OF SITE BY RAIL
 (Nearest B.G rail head & distance) :
 ACCESSIBILITY OF SITE BY ROAD
 (Nearest national highway & distance) :
 ACCESSIBILITY BY AIR
 (Nearest airport & distance) :
 ACCESSIBILITY BY PORT
 (Nearest port & distance) :

3. AVAILABILITY OF CONSTRUCTION MATERIALS (Aggregate, Sand and Water)
 PLACES OF AVAILABILITY :
 LEAD DISTANCES :
 QUANTITY AND TYPE OF MATERIALS :

1. CONSTRUCTION WATER
 (Requirement 100 cu.m per hour)
 SOURCE AND DRAWAL ARRANGEMENT :

2. CONSTRUCTION POWER AVAILABILITY (About 10 MVA)
 NEAREST SUB-STATION & DETAILS :

6. AVAILABILITY OF SEA WATER PLANT COOLING
 (3 LAKH CUM/HR/ 1000 MWe)

- SCHEMATIC SKETCH OF DRAWAL & DISCHARGE ARRANGEMENT :
7. LAND AVAILABILITY FOR EXCLUSION ZONE OF 1.6 KM AROUND REACTOR :
(Requirement 840 Ha. for 4000 MWe and 1000 Ha FOR 6000 MWe to be acquired)
- GRADE LEVEL FOR PLANT LOCATION :
(Reasonably flat land of 2.5 KM X 1 KM for 6000 MWe or 1.5 KM X 1 KM for 4000 MWe)
- TOWNSHIP LOCATION (Requirement of about 300 ha beyond 5 km from plant) :
8. FOUNDATION CONDITIONS NATURE OF SUB STRATA - ROCKY OR ALLUVIUM :
DEPTH TO HARD ROCK IF AVAILABLE :
DETAILS OF HEAVY STRUCTURES BUILT IN THE AREA :
9. POPULATION DETAILS AROUND PLANT SITE (As per 2001 census & latest estimates if available)
- 2 KM RADIUS :
- 2 TO 5 KM RADIUS :
- 5 TO 10 KM RADIUS :
- 10 TO 16 KM RADIUS :
- 16 TO 30 KM RADIUS :
- STATE AVERAGE POPULATION DENSITY :
- DETAILS OF POPULATION CENTRES AROUND PLANT SITE WITH POPULATION GREATER THAN 10,000 WITHIN 10 KM RADIUS :
- DETAILS OF POPULATION CENTRES AROUND PLANT SITE WITH POPULATION GREATER THAN 1,00,000 WITHIN 30 KM RADIUS :
10. SITE METEROLOGY (SITE OBSERVATIONS/ NEAR BY MET STATION)
- ANNUAL RAINFALL :

- EXTREME TEMPERATURE (WET / DRY BULB) :
- EXTREME WIND SPEED (WIND ROSE DIAGRAMS):
- EXTREME HUMIDITY :
11. DETAILS IF ANY AIRPORT (CIVIL OR MILITARY)
WITHIN 15 KM
NAME, NATURE OF THE AIRPORT
AND DISTANCE FROM SITE :
12. DETAILS OF FACILITIES IF ANY ALONG
WITH DISTANCE FROM SITE :
(Storing, handling inflammable, toxic,
corrosive or explosive materials or any mining
activities within 10 km radius)
13. DETAILS OF ANY MILITARY INSTALLATIONS :
(Along with distance from site storing
ammunitions etc. within 10 km radius)
14. DETAILS ALONG WITH DISTANCE FROM SITE :
(Of place of architectural historical monuments, pilgrimage
and tourist centres including ecologically sensitive area,
wild life sanctuaries within 30 km radius)
15. IS THE AREA PRONE TO SLOPE INSTABILITY,
SURFACE COLLAPSE, SUBSIDENCE OR UPLIFT? IF YES,
GIVE DETAILS. :
16. SEISMO-TECHTONICS :
(Potential for surface faulting presence of capable faults
within 10 km radius and occurrence of major earthquakes
within 30 km radius)
17. IS THE AREA PRONE TO SOIL LIQUIFACTION? :
18. POTENTIAL FOR FLOODING OF
SITE AND OCCURRENCE OF MAJOR
CYCLONES IN THE VICINITY :

Note: Suitable maps with regard to particulars giving information of point no. 1, 2, 3, 7, 10, 11, 12 & 13 may be enclosed



Site Selection sub committee Visit at Haripur W.Bengal

Kovvada Coast showing sea water level during High tide.



Site Selection sub committee Headed by S.Thakur ED(CP&CC) near one corner of KOVVADA plant exclusion zone.

NPCIL MISSION

To develop nuclear power technology and to produce nuclear power as a safe, environmentally benign and an economically viable source of electrical energy to meet the increasing electricity needs of the country.



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E-mail: skjena@npcil.co.in

www.npcil.nic.in