GUIDELINE ON HOW TO SUBMIT AN EXPRESSION OF INTEREST TO HOST THE EUROPEAN SPALLATION SOURCE

COUNCIL OF THE
EUROPEAN SPALLATION SOURCE PROJECT

Final version

November 28, 2001

The ESS COUNCIL invites all European members and European organisations to express their interest in hosting the European Spallation Source (ESS). This document describes the procedures and documents involved for the first phase (called “pre-qualification” or “informal bid”).
The how and when of the second phase – i.e. asking for formal bids – depends on the evolution of the European scene for decision making on large facilities.

Points of contact

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1. ABSTRACT

The decision for the ESS is forthcoming and the selection of a site for the facility is closely connected with this decision. Planning permission and licensing of the facility is not simple and months or even years can easily be wasted if not properly prepared. Site-dependent work, especially in the area of safety and licensing must therefore be initiated now well before the formal site proposals can be submitted.

The ESS COUNCIL invites all European members and European organisations to express their interest in hosting ESS. This document describes how to proceed with such an expression of interest, and what it implies. The necessary steps are:

1. Notify the ESS Central Project Team (CPT) as soon as possible, and initiate collaboration with the CPT on this issue.
2. Prepare a document that will demonstrate the feasibility and in a general way the quality of the proposed site. The deadline is 1 May 2002.
3. Introduce this first phase bid at the European User Meeting, where the ESS project will be presented, in Bonn at the “Alter Bundestag“ – former House of Parliament - from 15 to 17 May 2002.

4. The first phase bid will be evaluated by the ESS project for technically feasibility of the site and for the general attractiveness of the area as a host for such a large European facility.

The how and when of the second phase – i.e. asking for formal bids – depends on the evolution of the European scene for decision making on large facilities, because here the governments and funding agencies have to be involved. It is no longer something that can be handled by the laboratories or other organisations that constitute ESS.

The ESS proposal to be presented at the European User Meeting in May 2002 is a site independent proposal and will be based on a serious of assumptions:

- an ideal site for construction and operation,
- a site donated free of charge,
- access roads and utilities like electricity lines, town water supply, sewer system, telephone and computer links, etc. available at the site fence free of charge,
- the facility is exempted from VAT and tax,
- a given price for energy and manpower,
- the general conditions for the facility will not change over its lifetime.

The present document contains:

1. A short description of the ESS project followed by the site requirements and the questionnaire.
2. A description of the documents that should accompany the informal bid, and the commitment to collaborate with the CPT.
3. A description of procedures needed later to make a formal bid.

The latter is included in order to enable the informal bidders to estimate the time and efforts required for the procedure, and furthermore to enable them to initiate the tasks for the preparation of a formal bid.

2. INTRODUCTION

A licensing procedure is required in any host country before any legal construction can take place and it is in the interest of the ESS to avoid delays due to licensing problems. The ESS will also need to ensure that the host site of the ESS facility fulfils the site requirements meaning that there is a need for an "objective" site certification by means of presented documents by the host country candidates.

In comparing licensing procedures for nuclear facilities in different European countries, it was found, that there are differences in detail, but the general procedures are the same. Even in those countries, where the ESS will not be handled as a nuclear facility, it is expected that the authorities will follow the nuclear guidelines (with the exception of UK).

The host country of the ESS has to fulfil the site description part of the safety analysis report (for details see Appendix).

The present documentation is based on the relevant chapter on sites of the German guideline for preparation of commissioning documents for nuclear plants [1] with all parts not relevant to ESS omitted. We used parts of this site description, part of the safety analysis report and the ESRF questionnaire [6] to form the ESS questionnaire. Later, we compared the site description part with a site description part of a safety report, fulfilling the European Council Directive 96/82/EC [2] and learned that we are in full agreement.

3. THE EUROPEAN SPALLATION SOURCE

The ESS facility will be the future European front rank Neutron Source. Below we give an overview on the history of the ESS and the actual status of the project at mid 2001.

The ESS feasibility study 1993-1997
In the Large Facilities Report to the Commission of the European Community (CEC) in 1990, the Neutron Study Panel underlined the continuing need for neutron scattering and recognised that a major initiative was necessary to secure an effective ongoing neutron science programme in Europe for the year 2000 and beyond. Through a joint initiative of Forschungszentrum Jülich and Rutherford Appleton Laboratory, a series of meetings in 1991 and 1992 explored options for such a next generation European Neutron Source. These meetings formed the basis for the specification of the ESS – the European Spallation Source and marked the start of the feasibility study. The initiative was joined by a number of European laboratories. A Council of representatives from the partner laboratories together with observers from France and Spain was formed to oversee the study, which began in June 1993, and continued from December 1994 with CEC and ESF support.

In early 1997 the result of the study was published in 3 volumes (dated November 1996) [3].

ESS from 1997 to mid 2001
The end of the feasibility study marked the beginning of the R&D phase (1997-2000) and subsequently the proposal preparation phase (2001-2002). During this period several important developments took place:

1. It became clear that the reactor based neutron sources had reached their ultimate design with the ILL i.e. the ESS should not only be the next generation Spallation neutron source, but should be the next generation source for all neutron experiments.
2. Science has developed and the use of neutron scattering spread to new fields of science.
3. R&D on many of the critical technical issues, which were pointed out in the ESS feasibility study in early 1997, has been performed.

4. Superconducting (SC) accelerator technology has progressed dramatically and the ESS project has collaborated with CEA on a feasibility study CONCERT [4] for a large (25 MW) SC proton accelerator feeding up to 5 target stations for different science communities.
5. Both the US and Japan have started construction of 3'rd generation Spallation neutron sources, and they will take the leadership in Neutron scattering away from Europe, if we do not decide on the ESS as soon as possible.

The ESS project has responded to these points in different ways. The Scientific Advisory Committee (SAC) has reassessed the old ESS proposal in view of the above points 1 and 2, and at the ESS - SAC / ENSA Workshop in Engelberg on *"Scientific Trends in Condensed Matter Research and Instrumentation Opportunities at ESS"* May 2001 [5], it was very clearly demonstrated that the next front rank neutron Source in Europe (and the World) would need to have both, a short pulse target station (SPTS = repetition rate of 50Hz, pulse width of the proton pulse of 1,2 µs and a total beam power of 5 MW) and a long pulse target station (LPTS = repetition rate of 16 2/3 Hz, pulse width of the proton pulse of 2.5 ms and a total beam power of 5 MW). Thus the ESS Linac is required to deliver additionally 2.5 ms long pulse of about 110 milli-Ampere peak current interleaved between every third 50 Hz pulse. The peak linac current of the proton pulse has to be similar for the LPTS and the SPTS to keep space charge forces constant.

For a high current pulsed accelerator the choice between a normal or superconducting high-energy part of the linac is by no means trivial. As a consequence the ESS project has on purpose followed two different paths. The first is to revise the early ESS 1997 accelerator proposal in view of the R&D efforts and the second is to look at a SC version based on the ESS-CEA CONCERT study. It appears that both designs are capable of delivering the required performance. Currently ESS is assessing in more details risks, costs and engineering fine-tuning.

The ESS target stations

With both a short and a long pulse target station the layout of the facility has changed (see Figure 1 on page 7) compared to the early 1997 ESS study. The long pulse target station albeit very similar to the short pulse target station will however require substantial phase space tailoring of the neutron beams by neutron optical methods and choppers and another reflector design.

The beam is injected into the ESS targets horizontally, which not only makes the beam transport simpler and safer, but also has the advantage of an easier target handling system. The two target stations SPTS and LPTS will share the proton pulses. Figure 1 is a base line site layout of the ESS facility. All accelerator facilities (linac, 180° achromatic bend, compressor rings and beam transport lines) are buried under concrete and earth shielding.

Before entering the 50 Hz SPTS system the beam passes through an optional hall. This might either be used for muon experiments or other scientific installations.

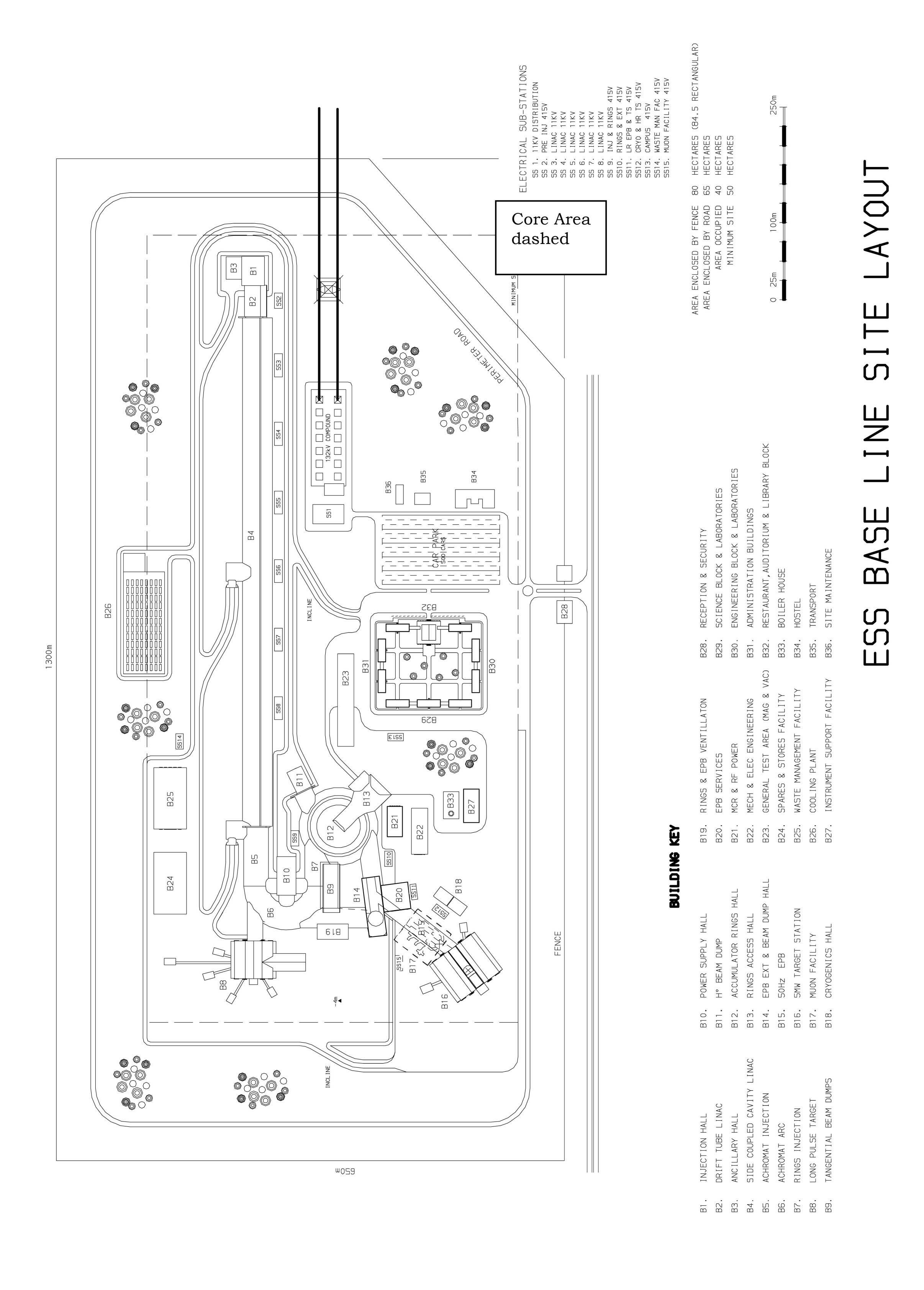

Figure 1: ESS – a possible base line site layout: The ESS facility showing the ion source (Front end), the linac tunnel with an achromatic 180^0 bend leading to the accumulator and compressor rings from where the beam is distributed to the Short pulse target station. The Long pulse target station is directly connected to the linac. Services & Workshops and Office buildings are also shown.

The two target stations could be of essentially identical design, as far as the targets and their handling systems are concerned. This has to be investigated further for the LPTS system, which is now under consideration.

We estimate that in comparison to the best facilities today, the proposed two 5 MW (SPTS and LPTS) target stations will enable a 50 – 1000 fold increase of sensitivity in most experiments. These gains are enabled by the on average 20 fold increase of the effective neutron flux and on average a 2-3 fold increase in instrument performance. This total gain will definitely open up new fields of scientific opportunities.

3.1. References

[1] Merkpostenaufstellung mit Gliederung für einen Standardsicherheits-bericht für Kernkraftwerke mit Druckwasserreaktor oder Siedewasser-reaktor, Bekanntmachung des Bundesinnenministeriums vom 26.7.1976 – RS I 4 – 513807/2

[2] Guidance on the preparation of a safety report to meet the requirements of Council Directive 96/82/EC (Seveso II), G.A. Papadakis, A. Amendola (Editors), Joint Research Centre, European Commission, EUR 17690 EN, 1997. This guidance is available on a web page:
http://mahbsrv.jrc.it/NewProducts-SafetyReport.html.

[3] ESS – A Next Generation Neutron Source for Europe,
Volume I: The European Spallation Source, ISBN 090 237 6 551
Volume II: The Scientific Case, ISBN 090 237 6 608
Volume III: The Technical Study, ISBN 090 237 6 659
For the full set the ISBN is: ISBN 090 237 6 500
The Study is available on a web page:
http://www.ess-europe.de/ess_js/about.html.

[4] CONCERT, Intermediate report on the feasibility study of CONCERT, Draft 1, draft available on a web page:
http://web.concert.free.fr/Publications/DraftReport.htm.

[5] ESS - SAC / ENSA Workshop in Engelberg on *"Scientific Trends in Condensed Matter Research and Instrumentation Opportunities at ESS"*, May 2001, report available on web page:
http://www.ess-europe.de/documentation/ESS_SAC_ENSA_2001.pdf

[6] ESRF Questionnaire used by the ESRF Progress Committee in 1984 (thanks to Karl Witte, Assistant to the Director General ESRF, for delivering a copy)

4. SITE REQUIREMENTS AND QUESTIONNAIRE

The present chapter describes the site specifications of the reference site that will be used as a basis for the ESS conventional facility study and the ESS costing.

Certain sites will not fully meet these specifications, and consequently special measures or design changes will have to be made for the ESS to be built at such a location. The eventual additional costs of such modifications necessary to restore the initial objectives, will be part of the site dependent cost and will be essential ingredients in the final bid to host the site and for the ultimate site selection process.

A list of the site requirements and the questionnaire is given below.

4.1. SIZE OF THE SITE

The site must have an area of about 1.04 km^2 (104 hectares) with minimum lengths of 1.3 km times 0.8 km in both perpendicular directions to accommodate the linear accelerator with its klystron hall, the long pulse target station downstream of the linear accelerator, the short pulse target station on the left side of the linear accelerator after the compressor rings, site supporting laboratories, offices, a library, workshops and administration. A possible base line site layout of the ESS is given in Figure **1** on page 7.

There should also be a possibility of extending the experimental facilities, i.e. by adding another target station, and laboratories.

01. What is the size of the proposed site?

    Provide sketches and diagrams of the **geographic location**. Specify longitude and latitude, altitude above sea level; federal state, province, district, and community. Provide a description of neighbouring, natural and artificial landscape features (e.g. rivers, lakes, mountains) and of the plant premises (e.g. boundaries, landfills, where applicable). Provide suitable maps on a 1 : 200 000, 1 : 50 000 and 1 : 25 000 scale as well as a drawing of the facility premises on a 1 : 1 000 site plan .

02. What is the land and water use of the proposed site?

    Describe the **land and water use** within 5 km including agriculture, forestry and fisheries.

    Describe landscape protection and nature conservation areas as well as areas serving recreational purposes including possible implications on costs of plant facility.

    Describe development trends if possible.

03. Who is the owner of the proposed site?

~~04.~~ Question deleted.

05. <u>How much more space could be made available for future extensions?</u>

    Describe possibilities for expanding the facility owned premises.
    Specify the owner of the proposed space for future extensions.
    Specify the cost of the proposed space for future extensions.

06. <u>Estimate how much time will elapse between the site decision and the start of construction?</u>

07. <u>Is the proposed site near to an existing laboratory? If yes, which laboratory is it and how far is it located from the site?</u>

08. <u>Which part of the infrastructure (buildings, laboratories, libraries, workshops) can be used and to what extent? Estimate cost.</u>

09. <u>What is the population distribution around the proposed site?</u>

    Describe the current population distribution data up to a radius of 10 km. List cities with more than 100 000 inhabitants within 50 km of the site giving their population and distance from the site.

10. <u>Indicate any local regulations or circumstances, which may make the availability of the site uncertain, or may restrict the nature of the buildings or the activities on the site?</u>

    I. **Hydrological conditions:** It is assumed that no exceptional hydrological conditions exist at the proposed site and the proposed space for future extensions.

       <u>Surface waters:</u>

       Describe type, location, size and other features (e.g. barrages) of streams, rivers, lakes, retaining basins and coastal waters in relation to the facility premises. A limited contamination of soil is expected despite of the shielding; for usual conditions it is not expected, that surface water contamination, resulting from contact of precipitation with contaminated soil, will meet limiting values. If under unfavourable conditions meeting of limiting values cannot be excluded, countermeasures are part of the duties of the host country.

       Describe development trends if possible.

       <u>Ground water:</u> The present reference design assumes no constrains in terms of depth and seasonal fluctuations of underground water levels that prevent the constructing of an underground accelerator system with compressor rings and beam lines.

       No special water control should be required to ensure that the ground water and the soil are protected from activation and contamination. Adequate shielding will provide protection of ground water and soil. If any additional shielding is required in order to exclude soil/ground water activation and contamination, or if the groundwater level has to be reduced by pumping, countermeasures are part of the duties of the host country. The fraction of precipitation contaminated by activated soil and flowing into the ground water, has to be part of these considerations, too.

Describe the regional and local ground water conditions (e.g. groundwater positions, sources, sinks, water levels, surface drainage, water permeability of the soil, groundwater flow), water use of deep wells, pumps and water storage facilities.

Describe ground water variations over time.

Give implications of the ground water situation on facility design and costs.

Drinking water recovery: It is assumed that no special precautions have to be made if there are drinking water recovery areas and drinking water facilities nearby.

Describe the drinking water recovery areas and facilities (groundwater, bank-filtered water, surface water, cisterns) with respective consumption quantities (where appropriate, graphical representation) within 5 km.

Give implications on facility design and costs.

Describe development trends if possible.

II. **Meteorological conditions:** It is assumed that no exceptional meteorological conditions exist at the proposed site.

Give a general description of meteorological conditions including implications on plant design and costs (if any).

III. **Emission, noise and power line conditions:** It is assumed that the proposed site must be situated in an area with no special restrictions concerning emissions, noise and power lines.

Give a general description of emission, noise and power line conditions including implications on plant design and costs (if any).

IV. **Cut and fill technique conditions:** It is assumed that the proposed site and the proposed space for future extensions is suitable for cut and fill techniques for the linear accelerator, the compressor rings and the beam lines.

Give a general description of the cut and fill technique conditions including implications on plant design and costs (if any).

V. **Radiological pre-exposure conditions given by other sources than ESS:** It is assumed that radiological pre-exposure conditions given by other sources than ESS will not influence the normal licensing procedure of the ESS.

Describe the current situation at the site and in an environment of 10 km.

Describe any current licensed or actual emissions of radioactive substances into air and water (type and quantity of emitted substances, location of emitters relative to the site).

Describe the restrictions on tolerable emissions from the planned facility due to existing emissions from other facilities.

Describe development trends if possible.

VI. **Safety requirements:** In general, only safety requirements that have become acceptable, over many years of operation, in large European accelerator laboratories should be necessary.

Indicate whether there are any restrictions concerning safety requirements on the proposed site, which make higher safety standards necessary.

VII. **Intermediate storage of radioactive equipment and waste:** Provisions have to be made to deal with the local storage of activated equipment resulting from the operation of the facility (the unit of the time involved is of the order of ten-years). A management plan for radioactive materials must be provided.

Describe the situation on the proposed site.

VIII. **Site preparation and donation:** It is assumed that at the required time the site will be ready for construction, with road access and all services ready to be connected at the site boundary.

- Road access for heavy trucks (maximum load of 100 t.) with free passage for a low loader carrying a railway wagon size load, linked with the motorway network.
- Suitable communication systems compatible with a modern international science laboratory.
- A reliable 150 MW electricity supply.
- Town water minimum flow of 200 m^3/h, (The measured RAL site water supply has been a maximum of 20 m^3/hr. The RAL Cooling Towers uses only 36500 m^3/year. Increasing the power dissipated by a factor of 20 takes us to 7.2 10^5 m^3/year giving 80 m^3/hr. A supply of 200 m^3/hr is assumed as an upper limit for the ESS. However, different countries may prefer different types of cooling systems such as air blast coolers.)
- Adequate water supply for fire fighting must be provided.
- Main sewer connections (rainwater, wastewater, etc.).

Describe the situation on the proposed site.

4.2. CONFIGURATION OF THE SITE

Since the linear accelerator, the compressor rings and the beam lines must be placed horizontally, it is obviously advantageous to have a site, which is as flat (no fill) and as horizontal as possible.

11. <u>What is the contour of the proposed site and the proposed space for future extensions?</u>

    Provide a contour map.

4.3. REQUIREMENTS FOR THE QUALITY OF THE GROUND

The performance of the linear accelerator, the compressor rings and the beam lines, in terms of minimum beam losses, requires a very stable and reproducible alignment of the beam. Misalignments are mostly induced by changes in position of the beam-guiding elements and non-uniform ground settlements can be a major cause of such changes. A complete realignment is a major task requiring a long shutdown of the ESS facility. One can accept a single realignment per year at the very beginning of the operation but the period should rapidly increase up to 5 years. The stability of the ground has to be such that the horizontal and vertical alignment of the accelerator is stable within 0.1 mm, over many months. Some key elements in the accelerator will be sensitive to high frequency vibrations, the peak-to-peak horizontal and vertical amplitudes from external sources of vibration must be very small (<< 0.1 mm).

12. <u>What are the geological conditions at the proposed?</u>

    Geological conditions: It is assumed that no exceptional geological conditions exist at the proposed site and the proposed space for future extensions. The ground should be compact and homogenous down to several tens of meters (use 60 m as a guide) with low compressibility and no water pockets.

    Describe the geological and tectonic conditions at the site with surface geology, strata contours and geological profiles of the underground material including groundwater, wells as well and folds, caves and mines. Supply a geological map of the area.

    Explain the suitability of the foundation ground. If special measures are necessary for making the foundation ground suitable for the facility, outline these measures and estimate the cost.

13. <u>What is known about seismic activity in the area?</u>

    Seismic conditions: It is assumed that no special precautions for seismic disturbance are necessary at the proposed site.

    Obtain expert seismic opinion containing the following information:

    List all historically reported earthquakes with an impact on the site or for which an impact on the site can be assumed. Provide measured or estimated data on the date of the events, their intensity, the damage that occurred and if possible a plan of the epicentre or the region of maximum intensity.

    List the site-dependent, seismic parameters, e.g.

    - Probabilities of occurrence,

- Duration of the earthquake, if any
- Implications of earth quake probability on ESS design and cost.

14. What is the ground load of the proposed site and the proposed space for future extensions?

    Ground load: The ground should be capable of sustaining loads of at least 40 t/m^2 throughout, not require special civil engineering techniques for building.

    Describe the ground load.

15. Is there any source of vibration or disturbance (e.g. traffic, quarries)?

    If yes, describe source of vibration or disturbance.

4.4. SERVICES

Electricity:
Electric power must be available on the site. An electrical supply rated at up to 150 MW is required. The quality of electricity supply can be based on Spallation Neutron Sources such as ISIS. Fluctuations in supply voltage are one of the reasons for power supply trips and these must be minimised. The following characteristics are assumed:

- Maximum amplitude variation of the voltage ± 7%
- Maximum frequency variation ± 1%,
- Supply interruptions exceeding 600 ms should not occur more than once per year on average.
- Voltage dips exceeding 400 ms, or with an amplitude larger than ± 12%, on two phases, should not occur more than three times per year.
- Voltage dips with an amplitude larger than ± 8%, on three phases, should not occur more than three times per year.
- The available short circuit power should be higher than 1000 MVA.

16. Is suitable electrical power available on the site?

~~17.~~ Question deleted.

18. What is the estimated cost of a KWh for a user of the ESS power level?

~~19.~~ Question deleted.

Water:
Adequate water and sewerage for 1000 person site must be supplied. This must meet the local regulations and cover safety requirements for the facility (fire hydrants may each need 100 m^3/hr). The make-up rate for cooling systems is estimated at 200 m^3/hr.

20. What is the minimum supply rate of town water at the site?

    Adequate provision must also be made to dispose of the water again after use. There is no danger of intolerable radioactive contamination during ESS – operation, either of cooling water or of the air.

    If fresh flowing water (or cold and clean sea water) should be available in quantity, they can be used directly. Describe the situation at the proposed site.

21. If the minimum supply rate of town water at the site not feeds the requirements, what are the costs of the installation of the supply?

22. What would an extension to 250 cubic-meters per hour costs?

23. What are the minimum and maximum temperatures, the hardness, the chemical and biological purity of the cooling water?

24. Are there any restrictions on the maximum temperature of discharged cooling water)?

4.5. THE SCIENTIFIC ENVIRONMENT

To enhance the scientific use of the ESS, it is desirable that active university departments or research laboratories in the fields of physics, chemistry, biology, geology, technology and medicine exist within a radius of 100 km of the facility.

25. What is the scientific environment at the proposed site?

    Present a table listing of the university departments and research laboratories in a radius of 100 km around the proposed site.

    List their main scientific interest and the number of graduate scientists in each. Indicate specifically those teams, which are working on or would be interested in neutron scattering.

4.6. COMPUTER CENTRE

Chapter deleted.

~~26.~~ Question deleted.

~~27.~~ Question deleted.

~~28.~~ Question deleted.

4.7. THE THECHNICAL AND INDUSTRIAL ENVIRONMENT

The ESS will benefit from the availability of facilities capable of the development of relevant electronics, detectors, cryogenics, informatics, ultra-high vacuum, computers, precision machines and optics. Additional space may be required if these facilities do not exist.

29. Which are the university departments, laboratories and industries, active in the above areas, within 100 km of the proposed site?

List the university departments, laboratories and industries, active in the above areas, within 100 km of the proposed site.

~~30.~~ Question deleted.

~~31.~~ Question deleted.

32. What is the experience for constructing and operating large research facilities in the area?

    Outline the experience for constructing and operating large research facilities in the area.

4.8. THE TRANSPORT INFRASTRUCTURE

The site must be connected to a road network, so that heavy trucks can reach it. Equally important is access to motorways, to an international railway network and to an international airport.

33. Is there a suitable road to the proposed site and what is the load?

    Load on access roads: Access roads to the site, provided at the site fence free of charge by the host country, must be capable of sustaining a maximum load of 100 t, with free passage for a low loader carrying a railway wagon size load. (Access from railroad to the facility should allow such transport).

    Describe the road to the proposed site and what load it can carry.

~~34.~~ Question deleted.

35. Which is the nearest railway station?

    Identify the nearest railway station indicating the average number of trains per day.

~~36.~~ Question deleted.

37. Which is the nearest international airport?

    Identify the nearest international airport indicating the average number of international flights per day.

~~38.~~ Question deleted.

39. Which are the connections from the site to the nearest international airport?

    Describe the connections from the site to the nearest international airport.

~~40.~~ Question deleted.

4.9. THE SOCIAL ENVIRONMENT

Seven to ten years after the construction have started, the ESS facility will employ about 600 people as staff and it will receive about 2000 visitors each year. Many of these will come from all over Europe and some from outside Europe. It is therefore important to provide housing and educational facilities for an international community. There should also be possibilities for employment of spouses.

41. Which are the towns near the proposed site, their size and the housing situation?

    Identify the towns near the proposed site, their size and the housing situation.

42. Are there international schools?
43. What are the educational facilities in general?
44. What is the hotel situation?
45. Are there facilities to accommodate visitors staying from a few days to several months?
46. What are the particular advantages of the proposed region for long-term residential for staff and their families?

    This question refers to characteristics such as climate, the landscape, opportunities for sports and recreation, cultural opportunities in the nearby town, etc.

4.10. Specialities of the Site

~~47.~~ Question deleted.

48. What are the special site dependent (and cost effective) regulations enforced by state or local authorities?
49. What is a realistic time schedule for start of the construction work on the assumption that political and financing decisions have been taken e.g. until spring 2004?
50. What is the temporary local support provided by the site offering organization during construction phase (e.g. planning, management, providing office space, furniture, computers, communication links, accommodation etc.)?

4.11. Status of the site proposal

51. Which body has already taken a binding decision to back up the site proposal?

    Specify the involvement of the government, ministry, city or any other authority to support the proposal.

52. Which institution is responsible for preparation of the site proposal?

4.12. Financing

53. What binding offers exist for financial contributions to the investment cost of ESS:

    I. Infrastructure (land, roads, power lines, etc.)

    II. Buildings

III. Machines

IV. Others?

54. Are there any offers to support the running costs (electricity, water, communications, maintenance, manpower, etc)?

5. PROCEDURE OF APPLICATION – INFORMAL BID.

The procedure of application is as follows:

1. Notify the ESS Central Project Team (CPT) as soon as possible, and initiate collaboration with the CPT on this issue.

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2. Prepare a document that will demonstrate the feasibility and in a general way the quality of the proposed site. The deadline is 1 May 2002.
3. Introduce this first phase bid at the European User Meeting, where the ESS project will be presented, in Bonn at the „Alter Bundestag“ – former House of Parliament - from 15 to 17 May 2002.
4. The first phase bid will be evaluated by the ESS project for technically feasibility of the site and for the general attractiveness of the area as a host for such a large European facility.

The how and when of the next phase – i.e. asking for formal bids – depend on the evolution of the European scene for decision making on large facilities, because here the governments and funding agencies have to be involved. It is no longer something that can be handled alone by the laboratories or other organisations that constitute ESS.

6. Appendix: The Content of the site description part of the later safety analysis report

This chapter has been added to inform the authorities of the proposed site, which information they have to deliver in the site description part of the safety analysis report, after having successful applied for the site. This chapter is for informational use only and has been added to give the authorities of the proposed site the possibility to start the needed activities early enough. (You can ignore this chapter for the questionnaire.)

This list is a first draft, which is subject to substantial changes and may be taken in this stage as rough indication only.

Detailed description of documents needed for the later site description part of the safety analysis report

SITE DESCRIPTION

Summarizing description of the classification of the site within regional and federal state/province/district planning, as far as available.

1 Geographic location

Specification of longitude and latitude, altitude above sea level; federal state, province, district, community, district and lot as well as description of neighbouring, natural and artificial landscape features (e.g. rivers, lakes, mountains) and of the plant premises (e.g. boundaries, landfills, where applicable). Suitable maps on a 1 : 200 000, 1 : 50 000 and 1 : 25 000 scale as well as plotting of the facility premises in a 1 : 1 000 site plan. Specifications concerning ownership at the site and possibilities of expanding the facility owned premises.

2 Settlement

The specifications required below should be the latest population data obtainable at the time of application filing.

Population density data should be given as follows, or in a similar manner: Graphical representation plotting concentric circles of 1, 2, 3, 5, 10, 20 and 50 km radii around the facility as the centre as well as plotting 30° segments (the north direction is the bisectrix of the first sector; the specification of the other sectors is clockwise.

Specification of the population figure for each arising field and of the population development to be expected, as far as official documents are available (including references). A table can also replace these specifications.

Specifications concerning major human accumulations to be expected, local directory for a surrounding area of 10 km indicating the distances from the site and the number of inhabitants.

Directory of cities with more than 100 000 inhabitants within 50 km of the site indicating their distance and number of inhabitants.

3 Land and water use

Description of the land and water use within 10 km including agriculture, especially dairy farming, forestry and fisheries.

For agriculturally or horticulturally used land the major products should be specified, for water use the scope of commercial and sport fishing.

Specification of landscape protection and nature conservation areas as well as areas serving recreational purposes including possible implications on costs of plant facility.

Specification of development trends as far as official documents are available, including references.

4 Commercial and industrial enterprises, military facilities

Specification of commercial and industrial enterprises including the type of products, number of employees, location with respect to the site, oil and gas pipelines, tank stores within about 10 km and military facilities.

Specification of the type and quantity of explosive substances produced, stored or transported near the planned facility. Specification of development trends (as far as official documents are available including references).

Description of additional protection measures against accidents resulting from these plants, if any, including costs.

5 Traffic routes

In the following chapters 5.1 to 5.2 the development trends should also be specified (as far as official documents are available including references).

5.1 Roads

Description of the road network (specifying the category, traffic volume, separated according to passenger and goods transport) as well as the location with respect to the ESS plant.

Description of the linkage of the facility to the traffic network.

5.2 Railways

Description of the railway network (specifying the traffic density, separated according to passenger and goods trains) as well as the location with respect to the facility.

Description of the linkage of the facility to the traffic network.

5.3 Waterways

Description of the waterways and port facilities (specifying the type and frequency of shipping traffic, separated according to passenger and goods traffic) and the location with respect to the facility.

Specification of particular features, e.g. crossing traffic, rapids, sluices.

Description of the linkage of the facility to the traffic network.

5.4 Airports and airways

Description of airports, aerodromes and landing grounds as well as air lanes for civil and military operation and of the location with respect to the facility within 50 km and of the type and frequency of air traffic.

Specification of approach and departure lanes.

Specification of building restrictions.

Specification of controlled zones and airspace restriction areas (where appropriate, excerpts from air charts, radio-navigation charts and low-level flight operation charts of the Armed Forces).

Description of additional protection measures against airplane crash, if any, including costs.

Description of the linkage of the facility to the traffic network.

6 Meteorological conditions

General description of meteorological conditions including implications on plant design and costs (if any).

Specification of the origin of meteorological data and observation periods. If no direct site data are available, recourse to neighbouring or comparable stations of the Weather Service; explanation of transferability and corrections to be made.

6.1 Dispersion statistics

Specification of the three-dimensional frequency distribution of wind speed, wind direction and stability classes (averaged over several years).

Wind direction division preferentially into 30° sectors or alternatively specification of the two-dimensional frequency distribution of wind direction and wind speed (averaged over several years) and frequency distribution of the stability classes (averaged over several years) or alternatively specification of wind direction distribution (averaged over several years).

If available, description of the dependence of wind conditions on height.

6.2 Inversions

Specification of frequency and, if available, duration and altitude of inversions.

6.3 Precipitations

Specification of monthly precipitations averaged over several years and their distribution on the wind rose.

6.4 Cooling tower operation

Additionally required for the impact of cooling tower operation on the following parameters:

Specification of air temperature, relative air humidity, cloudiness and sunshine duration on a monthly average, of the number of foggy days and ice days per year.

7 Geological conditions

Description of the geological and tectonic conditions at the site and in its environment with surface geology, basement contours and geological profiles of the underground material including groundwater, specification of wells as well as possibly existing folks, caves and mines (Supply of geological map of the area).

Explanation of the suitability of the foundation soil, if necessary also measures required for making the foundation soil suitable for the facility (including costs).

8 Hydrological conditions

8.1 Surface waters

Description of the type, location, size and other features (e.g. barrages) of streams, rivers, lakes, retaining basins and coastal waters in relation with the facility premises.

Specification of development trends (later: as far as official documents are available, including references.

Specification of flows (minimum water flow, NNQ, average low water flow, MNQ, mean water flow, MQ, mean high-water flow, MHQ, maximum flood water flow, HHQ) and water levels (minimum water level, NNW, average low water level, MNW, mean water level, MW, mean high-water level, MHW, maximum flood water level, HHW, where applicable, also tides and wave heights) of the receiving water including dates of the lowest and highest values up to the present.

Specification of the water temperatures of the receiving water (annual average, extreme values, possibly monthly average).

Specification of essential data from the thermal load scheme, if available.

Description of the formation of ice in the past.

8.2 Ground water

Description of the regional and local groundwater conditions (e.g. groundwater storeys, sources, sinks, water levels, surface drainage, water permeability of the soil, groundwater flow), water use of deep wells, pumps and water storage facilities.

Description of groundwater variations over time.

Implications of ground water situation on facility design and costs.

8.3 Drinking water recovery

Specification of the drinking water recovery areas and facilities (ground water, bank-filtered water, surface water, cisterns) with respective consumption quantities (where appropriate, graphical representation) within 10 km.

Specification of development trends (as far as official documents are available including references).

Implications on facility design and costs

8.4 Cooling water analyses

Specification of the chemical analysis of the waters used for cooling purposes (surface waters, wells).

9 **Seismic conditions**

This should reflect the essential contents of the required seismic expert opinion containing at least the following specifications:

a) Specification of all historically reported earthquakes with an impact on the site or whose impact on the site can be assumed; in this connection, the following measured or estimated data: date of the event, intensity and maximum intensity, damage occurred and possibly a plan of the epicentre or the region of maximum intensity.

b) The site-dependent, seismic parameters, e.g.
   - Probabilities of occurrence,
   - Duration of the earthquake, if any
   - Implications of earth quake probability on ESS design
   - The soil response spectra for safety-shutdown and design-basis earthquakes for 1 % and, if possible, 2 %, 5 % and 7 % critical damping with the following specifications:

   1ba) Maximum velocities to be expected with frequency range,

   1bb) Maximum displacements to be expected with frequency range,

   1bc) Maximum soil accelerations to be expected with frequency range,

   1bd) Maximum accelerations to be expected with frequency range.

   The response spectra serve for earthquake-proof design and cover all locally and temporally differing events.

c) Description of the physical behaviour of geological layers and substances underneath the planned facility foundation; transfer properties of the standard subsoil in the case of motions induced by earthquakes, e.g. velocity of the seismic waves, possibility of soil liquefaction.

d) Description of the relationships between epicentres or regions of maximum intensity of the historically reported earthquakes and tectonic structures; description of the tectonic structures as far as they are relevant for earthquake-proof design.

10 **Radiological pre-exposure**

Description of the current situation at the site and in an environment of 25 km specifying the licensed and actual emissions of radioactive substances into air and water (type and quantity of emitted substances, location of emitters relative to the site from nuclear facilities and, as far as determinable, from handling other radioactive materials. Summarizing description of the results of radiological measurements, of radioecological expert opinions, of official investigations concerning the stress capacity of the ecosystem, and of emission inventories or the like, as far as available. Explanation of the conclusions for the site.

Specification of development trends (later: as far as official documents are available including references).

Restrictions of tolerable emissions from planned facility due to pre-exposure.