JOINT ASSESSMENT OF SPECIFIC SITES AD HOC GROUP

Rokkasho Site

JASS Ad-Hoc Group Meeting Findings

Rokkasho 2-5 October 2002

Version 5.0

(24th January 2003)

0. INTRODUCTION

0.1 Record of the Meeting

The second JASS Ad-Hoc meeting has taken place in Rokkasho, Japan, on October 2nd to 5th 2002.

The assessment is being conducted in accordance with the dispositions set out in the NSSG-4 Attachment 8.

Related site proposal documents have been delivered to the members of the ad-hoc group the 18th of September 2002.

The JASS ad-hoc group took note of the various presentations by the Japanese proponent team in the fields applicable to the JASS.

In order to properly assess the submitted documentation, the ad-hoc group had also the opportunity to visit the proposed site location and the neighbouring community.

The ad-hoc group jointly drafted the findings that follow and that will be the basis, together with the analyses of other site proposals, for the final JASS report to be submitted to the Negotiators.

The present document may be updated on the basis of additional material requested by the Ad-Hoc group or supplied by the proponent team and made available in a timely manner.

The ad-hoc group will meet for the third and fourth meetings in Cadarache, France, on 3rd to 6th December 2002, and Vandellos, Spain, on 11th to 14th December 2002.

0.2 The Rokkasho Site

Japan's proposed Site for ITER is situated in Rokkasho, Aomori prefecture (see figure 1), in the northern part of the Honshu island. Rokkasho is about 45min drive north of Misawa city, which is in turn connected by four daily flights to the Haneda Tokyo airport.

The Site covers approximately 70 hectares and is physically located between the newly built Nuclear Fuel Cycle Facilities and the Takahoko Lake, which is directly connected to the Pacific Ocean via a channel about 2km long. The land will be provided to the ILE free of rent during the period necessary for construction, operation and deactivation. The provided area satisfies the ITER needs leaving some margin for flexibility (see figures 2 and 3).

The proposed ITER Site has the following significant physical attributes:

- Access – equipment can be delivered to nearby harbours.
- Topography – the Site is balanced with a change in grade of about 10 m which can be easily prepared to meet ITER specifications.
- Geotechnical – the Site is characterized by a strong soil structure with bedrock 10-20 m below ground level.
- Hydrogeological – control of groundwater during construction will be necessary but easily achieved.
- Seismic – The seismic characteristics of the Site are still under detailed evaluation. The use of seismic isolation rubber bearings for the Tokamak building is proposed to meet ITER assumptions.
- Meteorological – the weather conditions are generally within the design assumptions with an average monthly temperature ranging between –5 and 20 degrees C. However, heavy winter snowfall will require some small structural changes to the buildings.
- Water supply – the Site is served by a local potable water supply; a dedicated sewage treatment facility will be provided. Proximity to the Takahoko Lake and the seashore will provide flexibility in the choice of the heat rejection method.

The proposed Site is reasonably close (30km) to a 500kV substation and a dedicated double-circuit 275 kV power transmission line will be built for ITER in due course. The connected grid provides a secure supply, which can satisfy ITER's steady state; for pulsed power demands an additional investment is needed for active and reactive power compensation.

In Rokkasho, the active waste from ITER will be processed and disposed of as "Low-Level" radioactive waste. The Aomori Prefecture has agreed to the buried disposal of these radioactive materials inside the prefecture, and most likely within the neighbouring "Low-Level" Radioactive Waste Disposal Centre operated by the Japan Nuclear Fuel Limited.

For the transportation of large components, 5000-ton class ships and barges can be docked at the North Wharf in the Mutsu-Ogawara Port, which is 4km from the Site entrance and owned by the Aomori prefecture. ITER 600 tonnes components can be unloaded by installation of appropriate crane facilities (available ones are rated to 150t) or by use of dolly transporters with barges which would be loaded at a suitably furnished port.

The community immediately around the ITER Site shows strong support for the facility, The Aomori Prefecture and the Rokkasho Village have already assumed a strong commitment to nuclear energy development and research through support of the construction of the Nuclear Fuel Cycle Facilities in Rokkasho and nuclear power plants in the vicinity, at Higashidori and Oma.

The total population of Aomori Prefecture is about 1.5 million, including a little over 4000 foreign residents. The region offers a safe and secure living environment with lifestyle options primarily oriented towards outdoor activities, including taking advantage of the mountains, rivers, lakes, forests and coastlines of the region.

The local Aomori Prefecture government has outlined a proposal for the establishment of an international school, to be operated by the private sector, located in Rokkasho. This would offer an English language based education from kindergarten through senior high school, directed towards the International Baccalaureate.

Aomori Prefecture has also outlined a proposal for the private sector to establish "Lakeside Village" in Rokkasho-mura. Options for living accommodation would include family homes, townhouses and condominiums, available for rental. Additionally the ITER staff can access the local real estate market to rent or buy homes or land to build on.

Japanese industries participated in the construction and operation of several fusion devices, most notably in JT-60 in Naka, LHD in Toki, and the R&D projects undertaken during the ITER EDA. Therefore there is a proven domestic industrial capability in all areas of the ITER project. Japan is amongst the leading countries in the development of nuclear fusion and it does so at a number of scientific and research institutes with about 1,000 researchers.

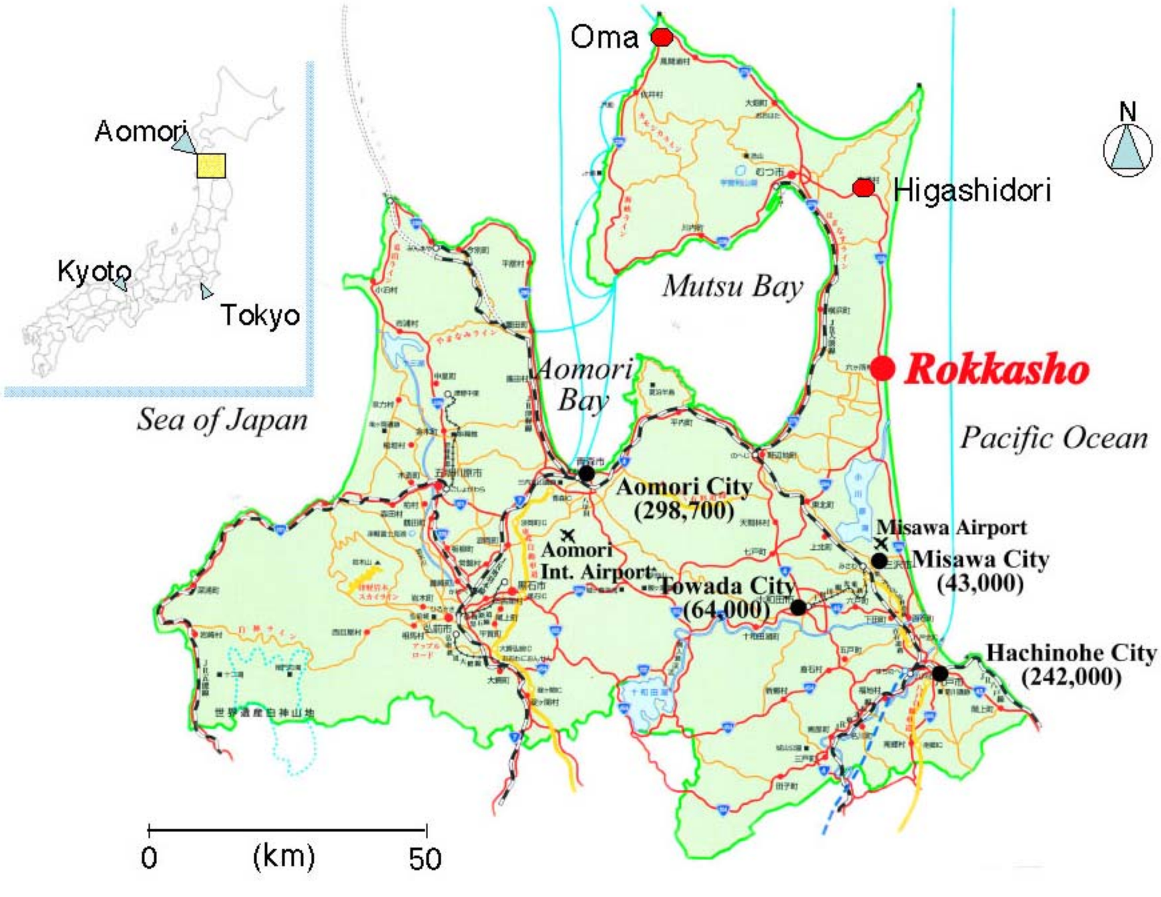

Figure 1: Location of the Rokkasho proposed Site in North Japan

Figure 2: Aerial photo of the proposed ITER Site between the Nuclear Fuel Cycle Facilities and Lake Takahoko.

Figure 3: Plan view of the proposed Site

1.0 TECHNICAL ASPECTS

1.1 SITE REQUIREMENTS

1.1.A Land

1.1.A.1 Land Area

Requirement The ITER site shall be up to 40 hectares in area enclosed within a perimeter. All structures and improvements within the perimeter are the responsibility of the ITER project. Land within the perimeter must be committed to ITER use for a period of at least 30 years.

Bases The minimum area for the ITER site is predicated on sufficient area for the buildings, structures and equipment with allowances for expansion of certain buildings if required for extension of the ITER programme.

The time period is specified to cover the construction (~10 years) and operations (~20 years) phases. Beyond that, the requirements for any decommissioning will be the responsibility of the Host Country.

JASS Criteria

1) Location, area
2) Present ownership and status, required to fit the site requirements, if any
3) Duration of use, transfer of ownership or lease
4) Constraints on use, if any
5) Proposal on specific site layout

The proposed Rokkasho ITER Site is located in the Prefecture of Aomori, approximately 60 km north-east of the City of Aomori. The Site is between the Takahoko Lake, which is directly connected to the Pacific Ocean via a channel about 2km long, and the Nuclear Fuel Cycle Facilities, which includes a low level waste repository and is owned by Japan Nuclear Fuel Limited.

The entire Site covers 70 hectares. The ITER layout proposed for the Rokkasho Site has minor changes from the original generic layout developed by ITER (40 hectares) and may be further optimised, leaving about 30 additional hectares available. Additional land contiguous to the Site could be made available.

The non-specific buildings and services (i.e. visitor centre, medical services, cafeteria, fire fighting, etc.) can be accommodated in the available land.

The current landowner is Shin Mutsu-Ogawara Inc. The Aomori prefecture will acquire the entire land and then provide it to the ILE free of rent during the period necessary for construction, operation and deactivation. Additional information is available in Section 4.

There are no constraints in the use of the land.

The requirements on land for siting ITER have been all satisfied by the Rokkasho Site.

1.1.A.2 Geotechnical Characteristics

Requirement The ITER site shall have foundation soil bearing capacity adequate for building loads of at least 25 t/m^2 at locations where buildings are to be built. Nevertheless, it is expected that it will be possible to provide at the specific location of the Tokamak Building means to support the average load of 65t/m^2 at a depth of 25m. The soil (to a depth of 25 m) shall not have unstable surrounding ground features. The building sites shall not be susceptible to significant subsidence and differential settlement.

Bases The ITER Tokamak is composed of large, massive components that must ultimately be supported by the basemat of the structures that house them. Therefore soil bearing capacity and stability under loads are critical requirements for an acceptable site. The Tokamak Building is composed of three independent halls on separate basemats, but served by the same set of large, overhead bridge cranes. Crane operation would be adversely affected by significant subsidence and differential settlement.

JASS Criteria

1) Complete geotechnical profile of the site. Geotechnical studies of the site should be referenced and available for examination by the JASS assessment team.
2) Proximity of a stable bedrock layer should be quantified, as should the estimated bearing capacity of this layer.
3) Demonstrate the manner in which excavation will take place for the concrete buildings, and to outline conceptual options for foundation structures. Excavation quantities should be estimated for construction at the site

The Site has been already somewhat characterized, comprising one set of data from 30m borehole at the Site. Some additional deeper borehole information is available from the neighbouring region.

The Neocene Bedrock (Takahoko) appears at a shallow level (about 10-20 m below the ground level), similar to the neighboring Nuclear Fuel Cycle Facilities.

Geological investigations at the Site area confirmed previous findings indicating a bearing capability of the bedrock of more than 200 ton/m^2 and a sufficient thickness and extent of the Takahoko Strata.

Excavation work for the Tokamak Building will be carried out by using a water-shield wall to deal with the ground water. By using a direct foundation on the Takahoko Strata, the required long term surface load of 65 ton/m^2 can therefore be supported for the Tokamak Building. For the other buildings, various foundation methods are available, such as pillar foundation, so that the required support of a long term surface load of 25 ton /m^2 can be satisfied.

The site conditions at Rokkasho fulfil all geotechnical requirements set out by ITER for foundations of structures. No change to the embedment of the Tokamak building would be required for the Rokkasho Site.

1.1.A.3 Water Supply

Requirement The ITER site host shall provide a continuous fresh water supply of 0.2 m^3/minute average and 3 m^3/minute peak consumption rates. The average daily consumption is estimated to be about 200 m^3. This water supply shall require no treatment or processing for uses such as potable water and water makeup to the plant de-mineralized water system and other systems with low losses.

Bases The ITER plant and its support facilities will require a reliable source of high quality water. The peak rate of 3 m^3/minute is specified to deal with conditions such as leakage or fires. This water supply is not used for the cooling towers or other uses which may be satisfied by lower quality, "raw" water.

JASS Criteria

1) Capacity of potable water and industrial water
2) Plan of the water supply and the system
3) Status of the water supply
4) Sources of the water supply, and restrictions, if any

Potable and industrial water supplies of the required capacity will be available by connecting to the existing supply system. The maximum supply of potable water is 2,000 m^3/day, and that of industrial water is 3,000 m^3/day.

1.1.A.4 Sanitary and Industrial Sewage

Requirements The ITER site host shall provide sanitary waste capacity for a peak ITER site population of 1000. The host shall also provide industrial sewage capacity for an average of 200 m^3/day.

Bases The ITER project will provide sewer lines to the site perimeter for connection to sewer service provided by the host. The peak industrial sewage rate is expected to be adequate to deal with conditions such as leaks and drainage of industrial sewage stored in tanks until it can be analyzed for release. Rainwater runoff is not included in industrial sewage.

JASS Criteria

1) Industrial sewage capacity
2) Plan of the sewage system
3) Status
4) Regulations on industrial sewage

An industrial sewage water treatment plant will be built for ITER outside the site fence. After treatment, the water will be drained into the seawater section of the Takahoko Lake. A maximum of 400 m^3/day can be drained to the Lake.

The generated sewage will satisfy the local environmental regulation concerning water pollution.

For cooling water, see Section 1.1.B.

1.1.B Heat Sink

Requirements The ITER site shall have the capability to dissipate, on average, 450 MW (thermal) energy to the environment.

Bases ITER and its associated equipment may develop heat loads as high as 1200 MW (thermal) for pulse periods of the order of 500 s. The capability to dissipate 1200 MW should be possible for steady state operation which is assumed to be continuous full power for one hour. Duty Cycle requirements for the heat sink at peak loads will not exceed 30%. The average heat load would be no more than 450 MW for periods of 3 to 6 days.

JASS Criteria

1) The maximum energy allowed to dissipate to the environment
2) Regulations and/or restrictions on energy dissipation to the environment

The Site is located close to the seashore and gives the possibility to reject heat either by releasing the cooling water directly to the Mutsu-Ogawara Port or by the use of cooling towers.

In case of seawater cooling, the temperature rise in the loop should be kept below 7ºC. Also effects to the neighbouring fishing grounds will have to be considered. However according to an environmental study previously performed, a power station with a 3GW thermal output would satisfy such conditions.

In the case of cooling towers, the raw cooling water will be pumped from the fresh-water side of the Takahoko lake while the blow-down water can be discharged to the seawater portions of the lake after appropriate treatment in compliance with the local regulations.

1.1.C Energy and Electrical Power

ITER Plant Steady State Electrical Loads

Requirement The ITER site shall have the capability to draw from the grid 120MW of continuous electrical power. Power should not be interrupted because of connection maintenance. At least two connections should be provided from the supply grid to the site.

Bases The ITER Plant has a number of systems which require a steady state supply of electrical power to operate the plant. It is not acceptable to interrupt this power supply for maintenance of transmission lines, therefore the offsite transmission lines must be arranged such that scheduled line maintenance will not cause interruption of service. This requirement is based on the operational needs of the ITER Plant.

Maintenance loads are considerably lower than the peak value because heavy loads such as the Tokamak heat transfer and heat rejection systems will operate only during preparations for and actual pulsed operation of the Tokamak.

JASS Criteria

1) Capacity of the steady state electrical power supply
2) Number of lines
3) High Voltage Supply Scheme
4) Status of the supply
5) Construction power requirements need to be defined and addressed for the site
6) High voltage network and its capacity

While a relatively small (113MVA) substation is already in the vicinity of the Site (~1km) and will be used during the construction phase, the main 275kV substation (Kamikita) is about 30km southwest from the Site requiring a dedicated double-circuit 275 kV power transmission line to be built for ITER when required. This double-circuit line will provide power for both steady state and pulsed loads.

See also Section 1.2.C

1.1.D Transport and Shipping

1.1.D.1 Maximum Size of Components to be Shipped

Requirement The ITER Site shall be capable of receiving shipments for components having maximum dimensions (not simultaneously) of about:

- Width - 9 m
- Height - 8 m
- Length - 15 m

Bases In order to fabricate the maximum number of components, such as magnet coils and large transformers, off site, the ITER site must have the capability of receiving large shipments. For the reference case, it is assumed that only Poloidal Field Coils will be manufactured on site, unless the possibility of transporting and shipping these large coils is proven feasible. For the same reason, it is also assumed that the CS will be assembled on site from six modules, unless it proves feasible that the Assembly may be supplied as one large and complete unit. The cryostat will be assembled on site from smaller delivered parts. The width is the most critical maximum dimension and it is set by the Toroidal Field Coils which are about 9 m wide. The height is the next most critical dimension which is set by the 40° Vacuum Vessel Sector. A length of 15 m is required for the TF coils. The following table shows the largest (~100 t or more) ITER components to be shipped:

Largest ITER Components to be Shipped

Component	Pkgs	Width (m)	Length (m)	Height (m)	Weight (T) Each Pkg
TF Coils	18	9	14.3	3.8	280
VV 40° Sector	9	8	12	8	575
CS Modules	6	4.2	4.2	1.9	100
Large HV Transformer	3	4	12	5	250
Crane Trolley Structure*	2	(14)	(18)	(6)	(600)

* Crane dimensions and weight are preliminary estimates.

PF Coils and CS Assembly**

Component	Pkgs	Width (m)	Length (m)	Height (m)	Weight (T) Each Pkg
PF-1	1	9.5	9.5	2.4	200
PF-2	1	18.5	18.5	1.9	200
PF-3	1	25.5	25.5	1.2	300
PF-4	1	26.0	26.0	1.2	450
PF-5	1	18.2	18.2	2.4	350
PF6	1	10.8	10.8	2.4	300
CS Assembly	1	4.2	18.8	4.2	850

** **Note that transportation and shipping of the PF Coil and of the CS Assembly are not requirements, but could be considered an advantage**.
Note, too, that the PF Coils dimensions are for the coil and connection box envelope, and that for each coil there are vertical protrusions of ~1.5 – 1.8 m for the terminals.

JASS Criteria

1) Availability of the port where the heavy and large components can be landed. (The maximum size of the ship which can be docked, availability of the landing facilities and the customhouse, etc.)
2) The allowable maximum size and weight of the transportable components.
3) Map of the transport route from the port to the site
4) Status of the route and reinforcement of the port, roads and bridges, if any
5) Constraints, if any, on the transport of large and/or heavy components due to site topography.

For the transportation of large components, 5000-ton class ships and barges can be docked at the North Wharf in the Mutsu-Ogawara Port, which is 4km from the Site entrance and owned by the Aomori prefecture. ITER 600 tonnes components can be unloaded by installation of appropriate crane facilities (available ones are rated to 150t) or by use of dolly transporters with barges which would be loaded at a suitably furnished port.

The South Wharf of the Mutsu-Ogawara Port (2,000 ton class ship capacity) can also be utilised for unloading of frequent and lighter components.

With limited modifications, existing roads from the wharf to the Site allow transport of large components as large as 9m (width) x 8m (height) x 15 m (length), and as heavy as 600 ton. Should the transport of larger or heavier components (i.e. the outermost PF coils and/or CS assembly) be desirable, a dedicated road from the nearby port (North Wharf) to the Site will be built.

Generally the Rokkasho Site appears to meet all the site requirements on transport and shipping including the possibility to receive the largest PF coils (in this last case some infrastructural provisions must be put into place). Additional information was supplied to detail the planning and the scheme to be employed for delivery, for example the location of the closest large port facility furnished by a 600 tons crane and thus capable to transfer the shipments from the incoming ship to the barge that would carry it to the Mutsu-Ogawara port, and also the cost of such unloading-loading operation.

1.1.D.2 Maximum Weight of Shipments

Requirement The ITER Site shall be capable of receiving about a dozen of components (packages) having a maximum weight of 600 t and approximately 100 packages with weight between 100 and 600 t each.

Bases In order to fabricate the maximum number of components, including magnet coils, off site, the ITER site must have the capability of receiving very heavy shipments. The single heaviest component (Vacuum Vessel Sector) is not expected to exceed 600 tonnes. All other components are expected to weigh less.

JASS Criteria
None specified

See section 1.1.D.1.

1.1.E External Hazards and Accident Initiators

No Compulsory Requirements.

General

There are no compulsory requirements.

1.1.F Infrastructure

No Compulsory Requirements

General

There are no compulsory requirements.

1.1.G Regulatory and Decommissioning

Details of the regulatory framework for ITER will depend on the Host Country. At a minimum the Host's regulatory system must provide a practicable licensing framework to permit ITER to be built and to operate including, in particular the following:

1. the transport of about 25 kg tritium during the course of ITER operations
2. the acceptance and safe storage of activated material arising from operation and decommissioning.

The agreement with the Host should provide for the issue of the liability for matters beyond the capacity of the project that may arise from ITER construction, operation and decommissioning.

JASS Criteria

1) Experience and expertise of the tritium transport.
2) Regulations on the tritium transport.
3) Plan on how tritium will be shipped to the proposed site over the life of the project.
4) Arrangements to cover liabilities beyond the capacity of the project needs to be covered in the description.
5) Regulations, practices and plan for the deactivation, storage and decommissioning of ITER and its materials.

JAERI already has some previous experience with tritium transportation from Canada (3 times) and the USA (6 times).

It is estimated for the DT operation in ITER that approximately 150 g tritium is transported six times a year by using a transport package with a 50 g-T capacity as a unit.

Regulations associated with the tritium transportation have been already established in Japan, including transport package, land transportation, sea transportation and unloading from ships. Tritium transportation for ITER can be accomplished within the current framework of regulations. No additional local restrictions are imposed on tritium handling by the administration of the Aomori Prefecture.

Radioactive wastes from ITER will be processed and disposed of as “Low-Level” radioactive waste.

The Aomori Prefecture has agreed to the buried disposal of radioactive materials inside the prefecture, and most likely within the neighboring “Low-Level” Radioactive Waste Disposal Center operated by the Japan Nuclear Fuel Limited.

See also chapter 5.

The aspects covering the point of “Arrangements to cover liabilities beyond the capacity of the project needs to be covered in the description” (JASS criteria point 4) has not been addressed by the proponent. These will be addressed in the "Agreement on the Establishment of the International Fusion Energy Organization for the Joint Implementation of the ITER Project".

1.2 SITE DESIGN ASSUMPTIONS

The following assumptions have been made concerning the ITER site. These site design assumptions are uniformly applied to all design work until the actual ITER Site is selected.

1.2.A Land

1.2.A.1 Land Area

Assumption During the construction it will be necessary to have temporary use of an additional 30 hectares of land adjacent to or reasonably close to the compulsory land area. It is assumed this land is available for construction laydown, field engineering, pre-assembly, concrete batch plant, excavation spoils and other construction activities.
During operating phases, this land should be available for interim waste storage, heavy equipment storage and activities related to maintenance or improvement of the ITER Plant.

Bases The assumptions made for the cost and schedule estimates are based on construction experience which uses an additional area of 25 hectares. Only a very limited amount of vehicle parking space (5 hectares) is allocated to the compulsory area, whereas similar amount will be required to satisfy temporary needs during construction.

JASS Criteria

1) Location and area of additional land used to support construction
2) Present ownership and present state, required work to fit the Site Requirements, if any
3) Duration of use, transfer of ownership or lease
4) Constraints on use, if any
5) Proposal on the specific site layout

See also point 1.1.A.

A sufficient amount of land is available so as to allow for flexibility in the site layout as well as satisfy temporary needs during construction.

1.2.A.2 Topography

Assumption The ITER site is assumed to be a topographically "balanced" site. This means that the volumes of soil cuts and fills are approximately equal over the compulsory land area in Requirement A.1. The maximum elevation change for the "balanced" site is less than 10 m about the mean elevation over the land area in the compulsory requirement.

JASS Criteria

1) Map of the site, difference of elevations
2) Plan of the land preparation, including areas set aside to handle soil storage.

See also section 1.1.A

Detailed information regarding the topography of the Site is available. The Site is already quite balanced and can be easily prepared to accommodate ITER with an expected finishing grade of ± 2m at a level about 50m above sea level. The estimated cut-and-fill volume is about 2.2 Millions m^3.

1.2.A.3 Geotechnical Characteristics

Assumption The soil surface layer at the ITER Site is thick enough not to require removal of underlying hard rock, if present, for building excavations, except in the area under the Tokamak Building itself, at an excavation level of about 25 m.

JASS Criteria

1) Soil Configuration and characteristics

See also section 1.1.A.2

The Takahoko Strata appears at a relatively shallow depth (ca. 10-20 m below the ground level). A loamy layer and sand layer lie above the Takahoko Strata, and excavation work down to the bed-rock will be carried out with conventional techniques.

1.2.A.4 Hydrological Characteristics

Assumption Ground water is assumed to be present at 10 m below nominal grade, well above the Tokamak building embedment of up to 16m below nominal grade. This assumption will require engineered ground water control during the construction of the Tokamak building pit.

JASS Criteria

1) Known groundwater characteristics and control experience at the entire site, supported by site inspection reports available for review by JASS assessment team
2) Plan for management of groundwater during and after excavation/construction

At the ITER Site, the groundwater table is estimated to be about 5m below the existing ground from the boring data taken for the construction of other facilities adjacent to the Site. For this reason groundwater management is necessary during construction and operation.

Groundwater control during construction at the ITER Site will be managed using conventional measures such as the use of a water shield.

Given the soil and topology characteristics, long-term management of groundwater will also be conventional while not required from a regulatory standpoint.

1.2.A.5 Seismic Characteristics

Assumption The ITER seismic design specifications for the applicable Safety Importance Class (SIC) are based on an assumed seismic hazard curve. Using the IAEA seismic classification levels of SL-2, SL-1, and SL-0 and the assumed seismic hazard curves, the following seismic specifications are derived:

SIC	IAEA level	Return Period (years)	Peak** Ground Acc.
1*	SL-2S 85% tile	10^4	0.4
2,3	SL-2 50% tile	10^4	0.2
3	SL-1 50% tile	10^2	0.05
4***	SL-0	short	0.05

* No ITER components in this class
** Peak Ground Acceleration is for both horizontal and vertical components in units of the gravitational acceleration, g.
*** SIC 4 components, the seismic specifications are not derived probabilistically - local (uniform) building codes are applied to this class. A peak value of 0.05g is assumed equal to the SL-1 peak value.

Bases Safety assessments of external accident initiators for facilities, particularly when framed in a probabilistic risk approach, may be dominated by seismic events. Assumed seismic hazard curves are used in a probabilistic approach which is consistent with IAEA recommendations for classification as a function of return period. The selection of the assumed seismic hazard curve is relevant to regions of low to moderate seismic activity. Prior to site selection, specification of the peak horizontal and vertical ground acceleration provide the ITER designers guidelines according to the methodology to be used for seismic analysis, which will rely on a specified Ground Motion Design Response Spectrum and a superposition of modal responses of the structures (according to NRC recommendations). After site selection the actual seismic specifications will be used to adjust the design, in particular by adding seismic isolation, if necessary.

JASS Criteria

1) Seismic design approach/guideline; e.g. deterministic/probabilistic, seismic classes, levels, and design standard
2) Seismic design conditions(data); e.g. Historical records of earthquakes, data of active faults, design seismic motion, and location of seismic excitation
3) Specification and assessment of Seismic isolator, if necessary

The relevant ITER design assumptions appear not to be met by the Rokkasho Site. The proponent has proposed the adoption of engineered seismic isolators to reduce the acceleration acting on the Tokamak, Tokamak building, and other components.

1.2.A.6 Meteorological Characteristics

Assumption A general set of meteorological conditions are assumed for design of buildings, civil structures and outdoor equipment, as follows:

- Maximum Steady, Horizontal Wind ≤ 140 km/hr (at 10 m elevation)
- Maximum Air Temperature ≤ 35 °C (24 hr average ≤ 30 °C)
- Minimum Air Temperature ≥ -25 °C (24 hr average ≥ -15 °C)
- Maximum Rel. Humidity (24 hr average) ≤ 95% (corresponding vapour pressure ≤ 22 mbar)
- Maximum Rel. Humidity (30 day average) ≤ 90% (corresponding vapour pressure ≤ 18 mbar)
- Barometric Pressure - Sea Level to 500 m
- Maximum Snow Load - 150 kg/m^2
- Maximum Icing - 10 mm
- Maximum 24 hr Rainfall - 20 cm
- Maximum 1 hr Rainfall - 5 cm
- Heavy Air Pollution (Level 3 according to IEC 71-2)

Bases The assumed meteorological data are used as design inputs. These data do not comprise a complete set, but rather the extremes which are likely to define structural or equipment limits. If intermediate meteorological data are required, the designer estimates these data based on the extremes listed above. Steady winds apply a static load on all buildings and outdoor equipment.

JASS Criteria

1) Temperature
2) Humidity
3) Rain fall
4) Wind velocity
5) Snow fall
6) Atmospheric pressure (elevation)
7) Availability of meteorological database of site characteristics over a period of years.

Most of the meteorological design assumptions are met in the Rokkasho Site.

However rather strong snow precipitation in the area causes the maximum snow load assumption to be quite exceeded (400-500 Kg/m^2 vs. the 150 Kg/m^2 assumed). For this reason some modifications to the sizing of the roof structures of the various buildings (in particular the Tokamak building superstructure) will have to be implemented in the design.

1.2.B Heat Sink

Water supply and industrial sewage for Heat Rejection System

Assumption The JCT has selected forced draft (mechanical) cooling towers as a design solution until the ITER site is selected. At 30% pulse duty cycle (450 MW average heat rejection) the total fresh ("raw") water requirement is about 16 m^3/minute. This water makes up evaporative losses and provides replacement for blowdown used to reduce the accumulation of dissolved and particulate contaminants in the circulating water system. During periods of no pulsing the water requirement would drop to about 5 m^3/minute.
Each blowdown action will lead to a peak industrial sewage rate of 3000 m^3/day.

Bases The actual ITER Site could use a number of different methods to provide the heat sink for ITER, but for the purposes of the site non-specific design, the induced draft (mechanical) cooling towers have been assumed. These cooling towers require significant quantities of fresh water ("raw") for their operation. For 450 MW average dissipation, approximately 16 m^3/minute of the water is lost by evaporation and drift of water droplets entrained in the air plume, and by blowdown. This water also supplies make up to the storage tanks for the fire protection system after the initial water inventory is depleted. Cooling towers may not be suitable for an ITER site on a seacoast or near a large, cool body of fresh water. Therefore open cycle cooling will be considered as a design option.

JASS Criteria

1) Cooling Tower System:
   - Water supply capacity and restrictions for the cooling system;
   - Capacity of the drainage and blowdown flow for the cooling system; and
   - Seasonal air temperatures and humidity levels, wet bulb temperatures.
2) Sea Water Cooling System/Once through Cooling System:
   - Distance from the coast;
   - Allowable increment in the temperature of the sea water; and
   - Average water temperatures and seasonal variations.

See also section 1.1.B

Mechanical draft cooling towers can be easily accommodated on the Site to satisfy the heat rejection capability. It is possible to supply fresh water necessary for the cooling tower system from the fresh water part of the Takahoko Lake (maximum 33,000m^3/day) and discharge the blow-down water, after appropriate treatment, to the seawater section of the lake.

Seawater cooling can also be accommodated at the Site as it is 4 km to the seashore. Seawater would be available for cooling most likely requiring an intermediate loop. The heat would be rejected into the Mutsu-Ogawara Port. The increase of seawater temperature at the boundaries of fishing area must and can be kept below 1ºC.

According to the observation record of the neighbouring Nuclear Fuel Cycle Facilities, the highest monthly average temperature of the seawater is 20.5ºC at 0.5 m below the surface, and 19.1ºC at 45 m below the surface in September. The lowest monthly average temperature is in March; 6.9ºC at 0.5 m below the surface, and 6.8ºC at 45 m below the surface.

1.2.C Energy and Electrical Power

1.2.C.1 Electrical Power Reliability During Operation

Assumption The grid supply to the Steady State and to the Pulsed switchyards is assumed to have the following characteristics with respect to reliability:

Single Phase Faults – a few tens/year 80%: t < 1 s
- a few / year 20%: 1 s < t < 5 min
where t = duration of fault

Three Phase Faults - a few/year

Bases ITER power supplies have a direct bearing on equipment availability which is required for Tokamak operation. If operation of support systems such as the cryoplant, TF coil supplies and other key equipment are interrupted by frequent or extended power outages, the time required to recover to normal operating conditions is so lengthy that availability goals for the Tokamak may not be achieved. Emergency power supplies are based on these power reliability and operational assumptions.

See also section 1.1.C

The electrical power reliability of the 275 kV grid in the past 10 years has been shown to satisfy the site design assumptions:

single phase faults:	less than 1 second	0.74/100 km year
	more than 1 second	0.04/100 km year
two – three phase faults:	less than 1 second	0.11/100 km year
	more than 1 second	0.019/100 km year

1.2.C.2 ITER Plant Pulsed Electrical Supply

Assumption A high voltage line supplies the ITER "pulsed loads". The following table shows the "pulsed load" parameters for the ITER Site:

Characteristic	Values
Peak Active Power* ,#	500 MW
Peak Reactive Power	400 MVar
Power Derivative*	200 MW/s
Power Steps*	60 MW
Fault Level	10-25 GVA
Pulsed Power Period**	1000 s
Pulse Repetition time	1800 s

from which up to 400 MW is a quasi steady state load during the sustained burn phase, while the remaining 80 – 120 MW has essentially pulse character for plasma shape control with a maximum pulse duration of 5 – 10 s and an energy content in the range of 250 – 500 MJ.

* These power parameters are to be considered both positive and negative. Positive refers to power from the grid, while negative refers to power to the grid. Power variations will remain within the limits given above for the maximum power and for the power derivatives.

** The capability to increase the pulse power period to 3600 s is also assumed.

Bases The peak active power, the peak reactive power and the power steps quoted above are evaluated from scenarios under study. Occasional power steps are present in the power waveform. The supply line for pulsed operation will demand a very "stiff" node on the grid to meet the assumption.

JASS Criteria

1) High voltage lines (plan)
2) Capacity of pulse electrical power supply (active and reactive)
3) Demonstrate that the site meets the criteria listed in the site assumptions through a technical study in conjunction with the electrical system operator: Impact of voltage, reactive power and system harmonics should also be addressed; Impact of ITER pulses of various lengths (from a few seconds to 3000 s), on the steady state power supply, and on grid
4) If a supplemental system is required, what are the design options and impacts on ITER, with respect to additional facility requirements, modifications to site interfaces, additional land area, potential additional hazards, impacts on ITER operation, etc.

See also section 1.1.C

A new dedicated 275kV power transmission double-circuit line from the existing node, Kamikita Transformer Substation (30 km away) to the Site will be built for the ITER operation phase.
A preliminary technical study by JAERI and Central Research Institute of Electric Power Industry shows that fluctuations of frequency and voltage on the electrical power grid due to the pulse power load of ITER can be reduced within the acceptable limits by a supplemental system including:

- an energy storage system (a variable speed FWMG with the stored energy of about 4 GJ),
- an additional reactive power compensation system (VAR compensator with the capacity of about a few hundred MVAR).

1.2.E External Hazards and Accident Initiators

1.2.E.1 External Hazards

Assumption It is assumed the ITER Site is not subject to significant industrial and other man-made hazards.

Bases External hazards, if present at the ITER site, must be recognized in safety, operational and environmental analyses. If these hazards present a significant risk, mitigating actions must be taken to ensure acceptable levels of public safety and financial risk.

JASS Criteria
If any
1) Aircraft and air routes
2) Factories, industrial complexes, and nuclear facilities

While the Rokkasho Site has no particularly strong requirements with regard to external hazards, some aspects are worth noting:

- The Site is adjacent to the Nuclear Fuel Cycle Facilities. Because of this, the local area will be subject to "Emergency Planning Zone" regulations and may be subject to administrative evacuation orders, but will benefit from increased security control.

- There are Misawa Airport and Misawa Air Base about 30 km south of the Site. An air route, called V-11 lies about 10 km west of the Site. As the airport is remote enough from the Site, and the aircraft are at the cruising altitude on that part of the route, the possibility of the aircraft crashing into the Site is relatively small and can still be considered beyond design basis.

- The Misawa Air-to-Ground Range boundary is approximately 6 km to the south of the Site. However, in consideration of the prohibition of the flight over nuclear facilities, prescribed directions and routes for the training flights, and the established emergency manoeuvres to be taken in case of difficulty, the possibility of an accident affecting the Site is reported to be negligible on the basis of a study performed for the adjacent Nuclear Fuel Cycle Facilities. . This study was made available and the results supported the findings that the probability of such an accident is sufficiently remote that it can be considered to be beyond the design basis accident for ITER.

1.2.E.2 External (Natural) Accident Initiators

Assumption It is assumed the ITER Site is not subject to horizontal winds greater than 140 km/hr (at an elevation of 10 m) or tornadic winds greater than 200 km/hr. The ITER Site is not subject to flooding from streams, rivers, sea water inundation, or sudden runoff from heavy rainfall or snow/ice melting (flash flood). All other external accident initiators except seismic events are assumed below regulatory consideration.

Bases The wind speeds specified in this requirement are typical of a low to moderate risk site. Tornadic winds apply dynamic loads of short duration to buildings and outdoor equipment by propelling objects at high speeds creating an impact instead of a steady load. The design engineer uses the tornadic wind speed in modeling a design basis projectile which is assumed to be propelled by the tornado. This design basis is important for buildings and structures that must contain hazardous or radioactive materials or must protect equipment with a critical safety function.

ITER is an electrically intensive plant, which would complicate recovery from flooded conditions. This assumption does not address heavy rainfall or water accumulation that can be diverted by typical storm water mitigation systems. For the purposes of this assumption, accidents involving fire, flooding and other initiators originating within the ITER plant or its support facilities are not considered external accident initiators.

JASS Criteria

1) Historical records of hazard caused by strong winds and high water.
2) Historical records of floods.
3) Historical records of land slides.

There is no record of floods at the location of the Site, including tsunami.

The Site does not present risks of soil erosion, landslide, excessive slanting, and avalanche.

1.2.F Infrastructure

General Bases The ITER Project is sufficiently large and extended in duration that infrastructure will have a significant impact on the outcome. Industrial, workforce and socioeconomic infrastructure assumptions are not quantitatively stated because there are a variety of ways these needs can be met. The assumptions are fulfilled if the actual ITER site and its surrounding region already meets the infrastructure needs for a plant with similar technical, material and schedule needs as ITER requires.

1.2.F.1 Industrial

Assumption It is assumed the ITER Site has access to the industrial infrastructure that would typically be required to build and operate a large, complex industrial plant. Industrial infrastructure includes scientific and engineering resources, manufacturing capacity and materials for construction. It is assumed the ITER Site location does not adversely impact the construction cost and time period nor does it slow down operation. The following are examples of the specific infrastructure items assumed to be available in the region of the site:

- Unskilled and skilled construction labor
- Facilities or space for temporary construction labor
- Fire Protection Station to supplement on-site fire brigade
- Medical facilities for emergency and health care
- Contractors for site engineering and scientific services
- Bulk concrete materials (cement, sand, aggregate)
- Bulk steel (rebar, beams, trusses)
- Materials for concrete forms
- Construction heavy equipment
- Off-site hazardous waste storage and disposal facilities
- Industrial solid waste disposal facilities
- Off-site laboratories for non-radioactive sample analysis

Bases Efficiency during construction and operation of a large, complex industrial facility varies significantly depending on the relative accessibility of industrial infrastructure. Accessibility to infrastructure can be demonstrated by comparable plants operating in the general region of the site.

JASS Criteria

1 Engineering resources and mfg capacity:

1) Accessibility to the industrial infrastructure with integrated experience in large projects especially for power plants and fusion facilities. The infrastructure would include:
   - Capability for fabrication of large components (e.g. vacuum vessel, PF coils, etc.);
   - High speed international communication network available to ITER;
   - Pool of neighbouring research oriented companies and their experience and competence relevant to a big project;
   - Facilities for supplying construction materials and equipment to the ITER site;
   - Off-site laboratories for non-radioactive analysis and their capacity; and
   - Handling requirements and restrictions on hazardous waste handling and disposal.

2 Scientific and research resources:

1) Already existing research facilities in the field of fusion, nuclear, and science.
2) Advanced computational facility, academically informative environment.
3) Broad and stable community support for the fusion research.

Japanese industries participated in the construction and operation of several fusion devices, most notably in JT-60 in Naka, LHD in Toki, and the R&D projects undertaken during the ITER EDA. Therefore there is a proven domestic industrial capability in all areas of the ITER project. Japan is amongst the leading countries in the development of nuclear fusion and it does so at a number of scientific and research institutes with about 1,000 researchers.

A high-speed international communication line up to the Site will be available in due time.

More than 1,000 enterprises have participated in the construction of the nearby Nuclear Fuel Cycle Facilities. About half of them are based within the local Aomori Prefecture.

By utilising already existing means of transportation, roads and port facilities, procurement of construction materials from all over the world is possible. Nonetheless materials can be also procured locally, for example, within 50 minutes by road from the Site, a total of 20,000 m^3/day concrete can be produced. An additional production capacity of 20,000 m^3/day exists in Hachinohe, which is about 90 minutes drive from the Site.

1.2.F.2 Workforce

Assumption It is assumed that a competent operating and scientific workforce for the ITER Plant can be recruited from neighbouring communities or the workforce can be recruited elsewhere and relocated to the neighbouring communities.

It is also assumed that ITER has the capability for conducting experiments from remote locations elsewhere in the world. These remote locations would enable "real-time" interaction in the conduct of the experiments, while retaining machine control and safety responsibilities at the ITER Site Control Facility.

Bases The workforce to operate, maintain and support ITER will require several hundred workers. The scientific workforce to conduct the ITER experimental program will also require several hundred scientists and engineers. The assumption that these workers and scientist/engineers come from neighbouring communities is consistent with the site layout plans which have no provisions for on-site dormitories or other housing for plant personnel.

A significant scientific workforce must be located at the ITER Site as indicated in the Assumptions. However, this staff can be greatly augmented and the experimental value of ITER can be significantly enhanced if remote experimental capability is provided. The result of the remote experiment is that scientific staffs around the world could participate in the scientific exploitation of ITER without the necessity of relocation to the ITER Site.

Remote experimental capability is judged to be feasible by the time of ITER operation because of advances in the speed and volume of electronic data transfers that are foreseen in the near future.

JASS Criteria

1) Define the pool of site engineering and scientific services and staff available to support ITER construction and operation with reference to their experience
2) Define the pool of construction labour available at or near the ITER site with reference to their experience, and the facilities needed to maintain and house the required workers drawn from this base

See also 1.2.F.1

Skilled personnel of all specialties needed for ITER construction are available from the labor force currently present in the neighboring communities. For example, more than 1,000 companies participated in the construction of the Nuclear Fuel Cycle Facilities, and about half of them are from Aomori Prefecture.

The JASS ad hoc group recognised the need to define in the JASS criteria the project requirements for the use of English as a working language, in particular in the Operation phase. Under the assumption that all ITER personnel will need to use English as a working language (to be confirmed at Negotiation level), the ad hoc group requested that: It should be clarified what is the domestic availability of skilled personnel and technicians for ITER who would satisfy such a requirement.

The JA response identified that “since this is an issue common to each site, this issue should be transferred to the investigation of the Agreement itself for further discussion.”

1.2.F.3 Socioeconomic Infrastructure

Assumption The ITER Site is assumed to have neighbouring communities which provide socioeconomic infrastructure. Neighbouring communities are assumed to be not greater than 50 km from the site, or one hour travel. Examples of socioeconomic infrastructure are described in the following list:

- Dwellings (Homes, Apartments, Dormitories)
- International Schools from Kindergarten to Secondary School
- Hospitals and Clinics
- Job Opportunities for Spouses and other Relatives of ITER workers
- Cultural life in a cosmopolitan environment

Bases Over the life of the ITER plant, thousands of workers, scientists, engineers and their families will relocate temporarily or permanently to the communities surrounding the ITER site. These people could comprise all the nationalities represented by the Parties. This "world" community will present special challenges and opportunities to the host site communities.

To attract a competent international workforce international schools should be provided. Teaching should be partially in the mother tongue following programmes which are compatible with schools in each student's country of origin. All parties should assist with the international schools serving these students.

The list of examples is not intended to be complete but it does illustrate the features considered most important. The assumed 50 km distance should maintain reasonable commuting times less than one hour for workers and their relatives.

JASS Criteria

See 1.2.F.1 and Section 2 (Socio-Cultural Aspects)

1.2.G Regulatory and Decommissioning

1.2.G.1 General Decommissioning

Assumption During the first phase of decommissioning, the ITER operations organization places the plant in a safe, stable condition. Dismantling may take place decades after the "deactivation" phase. Dismantling of ITER is assumed to be the responsibility of a new organization within the host country. The ITER operations organization will provide the new organization all records, "as-built prints", information and equipment pertinent to decommissioning. Plant characterization will also be provided for dismantling purposes after "deactivation".

Bases Experience and international guidelines (IAEA Safety Series No. 74, 1986, "Safety in Decommissioning of Research Reactors") stress the importance of good record keeping by the operations organization as a key to decommissioning success.

JASS Criteria

See Section 1.1.G and Section 3 (Licensing Aspects) and Section 5.2 (Decommissioning costs)

1.2.G.2 ITER Plant "Deactivation" Scope of Work

Assumption The ITER operations organization will develop a plan to put the plant in a safe, stable condition while it awaits dismantling.

Residual tritium present at the end of ITER operations will be stabilized or recovered to secure storage and/or shipping containers.

Residual mobile activation products and hazardous materials present at the end of ITER operations will be stabilized or recovered to secure storage and/or shipping containers such that they can be shipped to a repository as soon as practical.

ITER deactivation will include the removal of in-vessel components and their packaging in view of long-term storage. This removal from the vacuum vessel will be done by personnel and remote handling tools, trained for maintenance during the previous normal operation.

Liquids used in ITER systems may contain activation products, which must be removed before they can be released to the environment or solidified as waste. It is assumed that all liquids will be rendered to a safe, stable form during the "deactivation" phase, and afterwards no more cooling will be necessary

ITER "deactivation" will provide corrosion protection for components which are vulnerable to corrosion during the storage and dismantling period, if such corrosion would lead to spread of contamination or present unacceptable hazards to the public or workers.

Bases It is recommended (IAEA Safety Series No. 74, 1986) that all radioactive materials be rendered into a safe and stable condition as soon as practical after the cessation of operations**.**

JASS Criteria

See Section 1.1.G and Section 3 (Licensing Aspects) and Section 5.2 (Decommissioning costs)

1.2.H Construction Phase

General requirements for the construction phase (except land) are very dependent on local practice. However, water, sewage and power supplies need to be provided at the site for a construction workforce of up to 3000 people.

JASS Criteria

1) Provision of potable water, sewage (3000 men)
2) Provision of electrical power during the construction
3) Demonstration of general familiarity with the requirements associated with a large construction site. Accordingly, the availability of adequate site facilities, construction offices, temporary construction buildings, amenities buildings, etc. needs to be demonstrated

See section 1.1.A.3 for potable water

See section 1.1.C for electrical power

2.0 SOCIO-CULTURAL ASPECTS

2.A ACCESS AND TRANSPORT

2.A.1 Highway Transport

Assumption The ITER Site is accessible by a major highway, which connects to major ports of entry and other centres of commerce

JASS Criteria

1. Major streets access
2. Highway access
3. Transport restrictions for large/heavy components.
4. Commuting distances and times from major centres, ports etc.

2.A.2 Air Transport

Assumption The ITER Site is located within reasonable commuting time from an airport with connections to international air service.

JASS Criteria

1. Access to international airports
2. Number of international flights

2.A.3 Rail and Waterway transport

Assumption It is assumed the ITER site will have rail and waterway access. The railway is assumed to connect to major manufacturing centres and ports of entry.

JASS Criteria

1. Major railway access
2. Major waterway access
3. Transport restrictions for large/heavy components

See also section 1.1.A for land description and 1.1.D for transport and shipping.

Information contained in this section was provided by representatives of Aomori Prefecture Government.

1) Road transport

The JASS Ad-hoc Group was given the opportunity to visit the proposed Site, located approximately 35km (45 min drive) north of Misawa City, and to check the access and transport.

The proposed Site is accessible by Route 338, a 2-lane road running north from Misawa City. The nearest point of the expressway is currently Misawa City.

To drive on the roadways, ITER personnel and their dependants require an international driver's license (valid for one year) or a Japanese driver's license, which can be obtained following a straightforward test. Car insurance is compulsory and Japanese insurance companies recognize an individual's driving record from countries of origin where reciprocal arrangements are in place.

2) Air Transport

Access through international travel is via Misawa or Aomori Airport (~2 hours drive), normally to Haneda Airport for transfer to Narita (~75min bus transfer), a major international hub. There are currently 4 flights a day from Misawa to Haneda, and 9 flights a day from Aomori to Haneda. Overseas access to or from Rokkasho may require an overnight stay in Tokyo. The extension of the Shinkansen (bullet train) to Hachinohe will offer another option for transfer to Tokyo (~3 hours from Hachinohe).

3) Rail and Waterway Transport

The issue of rail access for ITER components does not apply. For personal transport, the Shinkansen (bullet train) service will be available at Hachinohe by 1 December 2002. There is a local rail network around Misawa and Noheji (25km from Rokkasho) and bus service around Rokkasho-mura.

Docking facilities are available at Mutsu-Ogawara Port (see Section 1.1D Transport and Shipping).

2.B SOCIAL INFRASTRUCTURE and LIVING CONDITIONS

Assumption The ITER Site is assumed to have neighbouring communities which provide socio-economic infrastructure. Neighbouring communities are assumed to be not greater than 50 km from the site, or one hour travel. Examples of socio-economic infrastructure are described in the following list:

1. Dwellings (Homes, Apartments, Dormitories)
2. International Schools from Kindergarten to Secondary School
3. Hospitals and Clinics
4. Job Opportunities for Spouses and other Relatives of ITER workers
5. Cultural life in a cosmopolitan environment

JASS Criteria

1) Living environment
2) Education (international schools, facilities)
3) Hospital and clinics
4) International cultural environment in neighbouring cities.
   - Name of the City, population
   - Summary of the urban function
   - Job opportunities for spouses of ITER workers.
   - Variety of lifestyle options
   - Safety and security
   - Cost effectiveness
   - Local services
   - Local worship options
   - Access to international travel
   - Cultural attractions
5) Serviced provided for long and short term visitors from abroad including volunteers‘ supports

Information contained in this section was provided by representatives of Aomori Prefectural Government.

1) Living Environment

The Ad-hoc group was given the opportunity to tour Rokkasho's as well as Misawa City`s surroundings and facilities. This visit was preceded by a 1 ½ hour presentation from Aomori Prefecture.

The practical locations for ITER family residents are mainly expected to be Rokkasho-mura and Misawa City. Accommodation is available for rental in these areas. Based on a small sample, the commercial rates appear to be 700-1000 Yen/m² per month. Indicative utility costs, including heating, are 30,000 Yen/month. Residential broadband internet services are readily available.

There was discussion of the option for ITER personnel to purchase houses or to purchase land for individual development. The following indicative data were provided:

- Land costs: 15,000 Yen/m² in Rokkasho
- General construction costs: 150,000 Yen/m² in Rokkasho

Aomori Prefecture outlined a proposal to establish a "Lakeside Village" in Rokkasho-mura. Options for living accommodation would include family homes, townhouses and condominiums, available for rental. Indicative rents for a detached house would be comparable to current market rates. Under the proposal, the land will be made available by the prefecture for development by the private sector. Discussions are currently underway between the prefecture and the possible developer(s).

Noted below are estimates of possible prices for Lakeside Village at the current stage; however, it may become less expensive through the leasing of land:

- Purchasing land (330m^2): 12,000,000 Yen

- Purchasing a detached house (land area: $330m^2$, floor area: $132\ m^2$): 38,000,000 Yen
- Renting a detached house (land area: $330m^2$, floor area: $132\ m^2$): 188,000 Yen/month
- Renting an apartment (floor area: $100\ m^2$, including furniture and appliances): 139,000 Yen/month
- Renting an apartment (floor area: $80\ m^2$, including furniture and appliances): 119,000 Yen/month, 30,000 Yen/week

Once an area has been designated for residential development, approval by the local government can be secured within a month. There are currently 6 areas available for private residential development in Rokkasho.

2) Education

A thorough presentation was given of the Japanese education system from junior Kindergarten level to College/University level.

Japanese education facilities from primary to university would be available to the children of ITER staff; however, since a working knowledge of Japanese is necessary for students, it is expected there will be a need for an alternative international system

Aomori Prefecture outlined a proposal for the establishment of an international school, located in Rokkasho. If required, the school can be located in another area. This would offer an English language based education from kindergarten through senior high school, directed towards the International Baccalaureate. Under the proposal, the prefecture will ensure the provision of the land, facilities, and buildings, including a dormitory, and the establishment of the international school. The school would be operated as a satellite of an existing ECIS-accredited international school in Japan. The prefecture is currently in discussions with potential providers.

The tuition fees will be borne by the parents. As a preliminary indication, these are expected to be comparable to those of private international schools in Japan (1-2 million Yen/year).

The importance of achieving a critical mass of the student population for operating the school was recognized. This is unlikely to be achieved by ITER personnel alone. To mitigate this, the plan provides for the school to accept non-ITER students (including Japanese students). Dormitory space would be provided for these students from other areas.

If requested, provisions would also be made to offer space and facilities for children to be educated in their own system and language, other than English or Japanese. In this case, provision of the education will be the responsibility of the parents or home authorities concerned.

There are universities in Aomori City and Hachinohe, which presume a working knowledge of Japanese. There are also universities in the Tokyo and Kyoto/Osaka area where students can pursue a strictly English language curriculum and receive credits towards graduation. The costs of these programmes does not differ from regular Japanese programmes.

3) Hospitals and Clinics

Japan's National Health Insurance System provides access to a complete range of medical facilities and services and pharmaceuticals, including normal standards of dental care. The system is administered at the level of the local authority. This will be available to ITER personnel and families with resident status (duration longer than 3 months).

Normally, this is funded by a government insurance programme, to which the insured family contributes approximately 6.3 - 9% of its income, to a maximum of 530,000 Yen/year. In addition, the patient typically pays 30% of treatment costs (20% in the case of dependents).

It is also possible to gain full access through private insurance programmes.

Medical services are available as follows:

- In Rokkasho: there are 4 clinics and 3 dental offices, providing internal medicine, paediatrics, minor surgery, OB/GYN, and orthopaedic surgery.
- In Misawa: there are 4 hospitals, 27 clinics, and 10 dental offices.
- In Hachinohe: there are 22 hospitals, 165 clinics, and 100 dental offices.

The ratio of doctors to people in Misawa is 1/750, and Hachinohe is 1/550. Many doctors are able to communicate in English. Hospitals in Misawa City regularly deal with American nationals for a full range of treatments.

Emergency medical services are available as follows:

- For Class 1, minor conditions, service is provided in Rokkasho.
- For Class 2, serious conditions, service is provided in Misawa.
- For Class 3, critical conditions, service is provided in Hachinohe.

There is an Emergency Medical Services ambulance in Rokkasho for use where the doctor indicates that it is necessary to transfer a patient. A helicopter service is also available in the event of critical conditions.

Emergency services can be accessed by dialling 119. In Misawa City, English-language service is currently available, and this service will be extended to Rokkasho.

4) International Cultural Environment in Neighboring Cities

Rokkasho-mura is the municipality in which the Site is located, and has a population of about 12,000. The nearest city, Misawa, is 35km away from Rokkasho and has a population of about 42,000. The major cities, Hachinohe (population 240,000) and Aomori (300,000), are within 60km of the Site.

The total population of Aomori Prefecture is about 1.5 million, and includes a little over 4000 foreign residents.

Foreigners who intend to work in Japan need to obtain a status of residence enabling them to apply for a work permit. Normally, “dependant” status does not qualify a person to work more than 20 hours/week. In the event that “full-time” employment is sought, application for a change in status will be needed.

The opportunities for spousal employment are most likely to be found in language training and other educational fields.

Lifestyle options are primarily oriented towards outdoor activities, including taking advantage of the mountains, rivers, lakes, forests and coastlines of the region. The nearby cities do offer an urban lifestyle.

The region offers a safe and secure living environment.

The cost of living is lower in the Aomori area than in Tokyo, with accommodation being approximately 50% of that of Tokyo, and food costs approximately 80 %.

There are 13 places of Christian worship in Misawa City, 9 offering English language services.

There are a wide variety of Japanese cultural attractions throughout Aomori Prefecture, including museums, festivals, performing arts and concerts. There are also a variety of sports and recreational activities, including spas, accessible to the public throughout the year.

Aomori Prefecture will establish an organization to provide ITER families with support services, such as orientation, interpreters, and concierge to help with their relocation and daily life. In addition, Rokkasho will offer public services at municipal offices in English. All the signs in the village will also be displayed in English.

3.0 LICENSING ASPECTS

Roadmap toward a License including construction, operation, decommissioning

JASS Criteria

1) Regulatory framework
2) Safety design approach /guideline
3) Steps of licensing procedures
4) Road map
5) Design standard, QA etc.
6) Restrictions on long lead procurement, site preparation, and financing activities
7) Proponent's commentary on obtaining a nuclear construction, operation, and decommissioning license.

(1) Regulatory framework

Japan builds and operates a significant number of nuclear power and research facilities and hence has well-established regulations for them. The ITER facility will be subject to laws and regulations etc. concerning nuclear safety, under the Japanese Atomic Energy Basic Law, since the facility generates radiation and holds radioactive materials such as tritium. The details are considered within the regulatory authority of the Japanese Government. It should be noted that the Japanese law requires an Environmental Assessment as part of the regulatory process only for nuclear power reactors, but not for research reactors nor for ITER. The regulatory body involved in the licensing of ITER is the Ministry of Education, Culture, Sports, Science and Technology (MEXT).

(2) Safety design approach/guideline

The ITER safety and structural features are quite different from those of a nuclear fission facility. MEXT has studied the safety features peculiar to the ITER facility and summarized safety requirements for regulation in a document entitled "On the Fundamental Approach for Ensuring Safety of the ITER Plant" in July 2000.

The Nuclear Safety Commission (NSC), under the cabinet office, has issued two statements focusing on the approaches for ensuring safety so far. One is "Key Elements for Ensuring ITER safety" issued in August 2001, and the other one is "Approach for ITER Safety Regulations" issued in June 2002.

With the above document and those two statements, the basic requirements for securing ITER safety have now been established. MEXT is considering development of specific nuclear safety legislation and regulations, to be available by the end of 2003, and with a view that the ILE would be considered "as if" it were a domestic agency.

The major safety requirements to be examined are

a) Appropriate <u>radiation protection</u> of the public and workers against radioactive materials and radiation released from facilities to the environment during normal operating conditions,
b) <u>Prevention</u> of accidents by, for example, ensuring the structural strength of the components that contain radioactive materials and their supporting structures on the basis of the safety features peculiar to ITER,
c) <u>Mitigation</u> of consequences of accidents by using the ventilation and clean-up systems etc.

(3) Steps of licensing procedures

The basic concept of the safety regulatory procedures for ITER is to regulate necessary items, in a scientific and reasonable manner, in each stage of the design, construction, operation, and decommissioning. Each stage of the procedure is indicated below at point 4.

In Japan the safety regulation will take into account that:

a) The construction will take a long period,
b) Parts of equipment of the ITER facility will be offered from Parties in other jurisdictions,
c) The operation plan will proceed step by step, from H-H reaction stage, D-D reaction stage to D-T reaction stage,
d) Requirements on emergency preparedness for nuclear disaster, which are adopted for nuclear facilities such as nuclear power plants, are not to be considered when the experimental features of ITER are considered.

(4) Road map

In Japan, a step by step licensing process is being currently considered for ITER:

a) the construction license will be issued after the basic design of ITER has been verified to meet the basic safety requirements; the time foreseen for this activity is about 1 year, following an application by the ILE,
b) during the construction phase, additional detailed technical specifications reviews and inspections may be conducted, and an operation license will be issued,
c) during the operation phase, appropriate inspection of the device will take place at regular intervals,
d) after the end of the operation, a decommissioning license will be issued.

It was noted that the "road map" that was presented lacked precise dates, and could be made credible with the indication of specific proposed dates for: a)approval of the applicable codes and standards, b)the date of issue of the license, and c)the definition of the "0" date on the road map (tied to the creation of the ILE).

(5) Design Standards and QA

In accordance with the document titled "On the Fundamental Approach for Ensuring Safety of the ITER Plant", the Japan Atomic Energy Research Institute (JAERI) has been drafting codes and standards based on the specific features of fusion devices, including for example: its procurement system, electromagnetic loads with complex geometry, new fabrication and inspection techniques, use of non-metallic components etc.

More specifically an ad-hoc fusion reactor structural design code case is under consideration for publication by the JSME and the ASME. The target date for completion of the draft for this code case is the beginning of 2003.

It is understood that information on this fusion specific code case will be made available as soon as possible to the other Parties.

The regulatory authority will require the ILE to operate under a QA program that is in compliance with internationally recognized standards such as ISO.

Regarding the issue of possible requirements on language of working documents, the JA response stated: "The interaction between the Organisation and the government of Japan will be defined by the international agreement. Based upon the agreement, the Government of Japan will respect the standard languages adopted by the organisation pertaining to the language used in the licensing processes. It is not expected that only Japanese will be adopted as a standard language.

Verification of the working documents such as operational manuals, instruction manuals, and QA manuals will be confirmed, if required, by the regulatory authority. Although it is not a regulatory requirement, the languages used in these documents could be the standard languages of the Organisation. In the case that the operators and workers will be multinational due to the management decision of the Organisation, it will be desirable to provide working documents in the native languages of the workers.

4.0 HOST SUPPORT

4.1 SITE SUPPORT

JASS Criteria

1) Special conditions of the site offer
2) Public /community support
3) Securities (fire services, police)
4) Responsibilities of the host in water supply, electricity supply, and maintenance of the road.
5) Required/recommended relation with local governments and communities
6) Use of existing facilities e.g. libraries, cafeteria, etc.

1) Special conditions of the site offer

The Aomori Prefecture will provide 70ha of land free of rent for the duration of ILE activities. The ILE will be expected to observe applicable Japanese safety laws and regulations. The Japanese government and the local governments accept that the final disposal of the entire ITER waste is possible in the Site or its vicinity.

2) Public/community support

In October 1995, the Aomori Prefectural Assembly decided, by over 95% majority, to promote the siting of ITER in Rokkasho. In December of the same year, the Aomori Prefecture ITER Location Promotion Council was established with representation from 160 associations. In 2001 and 2002, two ITER location promotion events were held in Aomori City and, in total, 2,800 people participated. During the same period, 15 ITER explanatory meetings were held throughout the region, and 1,600 people participated. There was widespread support on these occasions.

3) Security

See also section 2. The Site area is served by emergency response services, including police, fire-fighting and ambulance services. The adjacent JNFL site has extensive emergency services.

4) Responsibilities of the host in water supply, electricity supply and maintenance of the road

The site requirements and site design assumptions for services and road access up to the site boundary will be met as part of the host obligations under the JIA. Within the Site boundary, the ILE will be expected to take full responsibility. This also applies to the acceptance, treatment and disposal of effluents.

5) Required/recommended relations with local governments and communities

To ensure the effective provision of the support and services for the ILE activities, an appropriate liaison committee is expected to be established consisting of the Director-General of the ILE and the representative of the Japanese government. (See note below)
The ILE and the local governments will make certain safety arrangements.

6) Use of existing facilities

There are no existing facilities on the Site. The proponents propose an arrangement with the private sector for a cafeteria service. Access to the libraries and computing facilities of major fusion research laboratories in Japan is under consideration.

5.0 FINANCIAL ASPECTS

5.1 OPERATIONAL COSTS

JASS Criteria

1) If a Party wishes, it could include in its proposal operating costs as an element to take into consideration for JASS. The operational costs should be analysed for the Site, considering the main categories of operating costs from the FDR. The same methodology of cost estimate as used for FDR should be used if possible.

The Rokkasho Site proponents stated that their estimation of total operational costs matches that of the Final Design Report, with a total estimated annual operation cost of approximately 28B-Yen.

The estimated annual cost of one professional person, employed from the local market, was reported to be about 15M-Yen. Support staff would cost about 12M-Yen per year*person.

The estimated annual cost of tritium has been based on the FDR cost plus about 50% transportation cost, giving an average of 1.9BYen per year.

In Japan the estimated annual electricity cost, for ITER operation, is estimated to be 5B-Yen. This assessment of this value has been is based on an electricity demand cost of 15 Yen/W/year (assuming 150MW in 30min) and an electricity consumption cost of 8Yen/kWh (*based on a total annual energy use of 330 GWh*).

The proponent provided further backup on the cost of operations, including electricity. The electrical rates indicated were based on about 8 yen per kwhr and a demand charge of about 15 yen/w/yr.

5.2 DECOMMISSIONING COSTS

JASS Criteria

1) Classification of the radioactive waste
2) ITER Waste management strategy
3) Dismantling strategy
4) Decommissioning costs (as listed in Section 1.1 G - Regulations and Decommissioning)

Radioactive waste from ITER will be processed and disposed as low-level radioactive waste in accordance with the report, "Basic Principle for processing and disposal of waste generated from RI facilities and laboratories (Atomic Energy Commission of Japan, 1998)". Accordingly, the radioactive waste of ITER will be classified and divided into High Beta-gamma Waste, Low Level Waste, and Very Low Level Waste. High Beta-gamma Waste will be buried in an intermediate depth pit (~50m), the Low Level Waste will be buried in a shallow land pit, and the Very Low Level Waste will be buried in a shallow land trench.

The duration of the waste control will be about 300 years for pit burial and about 30 ~ 50 years for trench burial. The Aomori Prefecture has agreed to the buried disposal of radioactive materials inside the prefecture, and most likely within the neighbouring Low-level Radioactive Waste Disposal Center operated by the Japan Nuclear Fuel Limited. In this case, the cost of transportation of the ITER waste to the facilities will be rather small.

JA provided some additional information, supporting the need for a common basis for the decommissioning work.

For estimation of decommissioning cost, it is necessary to evaluate all the costs for dismantling, storage, transportation, final disposition of the waste, and recovery of the site, except the de-activation cost, which will be borne by the Organisation.

In this estimation, final dismantling of the machine will start 30 years after its shutdown. Radioactive waste from ITER will be processed and disposed of as low level radioactive waste in accordance with the report, “Basic Principle for processing and disposal of waste generated from RI facilities and laboratories”. Accordingly, the radioactive waste of ITER will be classified as High Beta-gamma Waste, Low Level Waste, and Very Low Level Waste depending on the concentration of the radioactive nuclei. High Beta-gamma Waste will be buried in an intermediate depth pit (50~100 m), the Low Level Waste will be buried in a shallow land pit, and the Very Low Level Waste will be buried in a shallow land trench. Based on these schemes, the total cost of decommissioning carried out at the host country including the dismantling of the waste, storage, and final restoration of the site with the FDR machine (SS316L(N)) is estimated to be about 40,000,000,000 yen.

The cost of final disposal is being closely investigated. The cost of transportation should be very small. Details of the cost estimation are shown in Attachment 3 of the JA Addendum compared with the costs described in the FDR.