SECTION 12: ITER CANADA PLAN TO HOST ITER

THE ADVANTAGES TO THE ITER PARTIES OF CANADA HOSTING ITER

12.1 INTRODUCTION

A number of advantages arise to the Iter Parties with Iter being hosted in Canada at the Clarington site. This Section will summarize the major advantages to this decision, realizing that many of the issues are covered in considerable detail elsewhere in this Plan document. This Section is in no way intended to criticize other potential Iter sites, but to identify areas where there are significant differences, and where possible, to quantify these differences. As with the previous Iter Canada process that was used to select the offered Canadian site of Clarington, the comparison below does not attempt to highlight many of the excellent features of the Canadian site where there is equivalence to other potential global sites.

12.2 TRANSPORTATION OF RADIOACTIVE SUBSTANCES IS AVOIDED

By locating the Iter facility in Canada at the Clarington site, the transportation of activated components during the Operating Phase would be completely avoided. Also for locating Iter in Canada there will be no need to return to the Parties any materials activated during the project**.**

In addition, and perhaps the most critical issue facing the siting of Iter globally, since the Clarington and Darlington Nuclear Generating Station sites are adjacent to each other, and the source of the tritium is the Ontario Power Generation Tritium Removal Facility located at the Darlington Nuclear Generating Station, ***tritium could be transferred to Iter, without ever leaving a site that has been licensed by the Canadian Nuclear Safety Commission***. While it is technically feasible to transport tritium, and licensed containers do exist, it is difficult to gauge whether public opinion would be supportive over the next 35 years during which the Iter project must be approved, constructed, operated and decommissioned. This unique proximity of the primary source of tritium to the Clarington site should eliminate any concerns that might exist regarding transportation of tritium across public areas.

A successful environmental assessment is of paramount importance to the siting of Iter. Maximizing the chances of a successful, cost effective and timely environmental assessment must be considered a significant differentiating factor in selecting a site. Since the transportation of medium or high level radioactive materials and tritium would essentially be eliminated with the Clarington site, the communities and countries along any transportation route associated with other

sites, would not be engaged in the environmental assessment process as directly affected parties.

Each of the Iter Parties have had events in which the public has objected to some aspect of nuclear operations in their countries, including matters related to transportation. This includes Canada. The trend of public opinion on nuclear issues is clearly in the direction of increased caution and even suspicion of the industry. By locating Iter at the Clarington site, the existing location of the tritium, we would entirely avoid the risk to Iter of future public objection to tritium shipment. Locating Iter elsewhere could expose the project to the unacceptable risk of termination due to public intervention in the shipment of tritium.

12.3 ATTRACTIVE LOCATION FOR THE WORLD'S SCIENTISTS AND THEIR FAMILIES

The proximity of the Clarington site to Toronto and all of its socio-economic features has been described earlier in Iter Canada's Expression of Interest to Host Iter, and was considered one of the key advantages of the Canadian Clarington site by the Iter Parties. As discussed in detail in Section 8, Canada's cosmopolitan multicultural society would be attractive to international scientists, and would help ensure that Iter attracts and retains the very best minds needed to make the necessary advances in fusion technology.

12.4 GREATEST CHANCE TO GET THE UNITED STATES TO REJOIN ITER

Because of its proximity to the United States, and the very close domestic and international ties between Canada and the United States, it would be very convenient for the United States to rejoin Iter once a construction decision was taken. This is desired by all Iter Parties and is seen by some individuals as critical to the eventual success of fusion power. Iter Canada’s discussions with fusion officials in the United States, together with further discussions between United States legislators and Canadian parliamentarians confirm this view. The Bush Administration is showing a strong interest in future energy supply, including fusion, and its recent energy policy announcement included a mention of Iter. The selection of a Canadian site for Iter could hasten the US re-joining the project.

12.5 CANADA IS THE *NATURAL* LOCATION FOR ITER:

Canada is a location where the Iter Parties can meet their objective of successfully carrying fusion forward this next major step. Natural circumstances, such as the coincidence of availability of a prepared site and access to existing infrastructure; the proximity of the tritium fuel; the applicability of an existing regulatory framework; and the expertise of licensing and managing tritium facility operations safely make Canada a natural option as a location for Iter.

In agreeing to host Iter in Canada, neither the European Union nor Japan would be seen as having lost supremacy to the other. Each of the current Iter Parties would maintain its relative leadership role. Also, Russia's role in Iter would not be diminished relative to the others, since neither Europe nor Japan would achieve a special prominence from being host.

However, if the European Union or Japan did not host Iter, their industry and their potential local sites may experience the loss of economic benefits. As well there may be a national sense of lost opportunity from the international prestige gained from hosting. Offsetting these disadvantages would be many benefits.

The European Union and Japan would continue to maintain and demonstrate leadership by playing a significant role in Iter. Facilitated by existing telecommunication capabilities near the Clarington site, they, as well as Russia, would be able to establish remote operations centers in their territories, as well as apply their advanced technologies and human resources and involve their high technology industries.

In Iter Canada's proposal, all Iter Parties would have full access to the fusion technology, as well as shared responsibility for managing the project. We believe that the Canadian location would be attractive to each of the Iter Parties' best scientists who would be needed to make Iter a success and to maintain their nation's leadership in fusion. Each Iter Party would still enjoy international prestige through its leadership demonstrated by its scientific and technological contributions.

Furthermore, if Canada were selected as the site for Iter, it would participate directly and not through the European Union, as was done during the Engineering Design Activities. This opens the way for closer Canadian relations with all Iter Parties, and creates an equal relationship between the non-host Iter Parties and the host.

And finally, located geographically convenient for each of Russia, the European Union and Japan (and adjacent to the US), Canada provides convenient access to officials and scientists from all Iter Parties.

12.6 THE CLARINGTON SITE MEETS OR EXCEEDS ALL THE ITER TECHNICAL REQUIREMENTS

As discussed in Sections 5 and 10, the superb technical attributes of the Clarington site require no compromises or concessions, compared with any of the Iter site requirements or site assumptions.

12.7. THE FAVOURABLE LICENSING ENVIRONMENT

As concluded in Sections 7, Canada provides the most attractive licensing environment in the world today for a fusion facility, and licensing activity has been formally started for the Clarington site.

12.8 SAVINGS TO THE ITER PARTIES DURING THE CONSTUCTION PHASE

There are a number of areas where cost savings will accrue to the Iter Parties for having Iter located at Clarington. Iter Canada has conducted a broad cost comparison, using as the reference document a comprehensive new report by KPMG which provides an in-depth comparison of business costs in Europe, North America and Japan[1].

12.8.1. **The Site and Site Infrastructure:** A well developed site for Iter, with established infrastructure, a transportation network, electrical connection to an acceptable power grid, public acceptance, known topographical conditions, favourable seismic conditions, environmental acceptance and the required nuclear licensing has been valued by the Iter Parties at 15 to 25% of the Construction Phase costs, ie. approximately US $1 billion.

While the cost of the actual physical site and off-site infrastructure has not normally been included in the overall Iter budget estimates (eg. it was not part of the 1998 Iter FDR or 1999 ODR cost estimates, nor the recent Procurement Package estimating process, and it has not been included in the cost analysis in the draft Iter Final Design Report), it is a real cost to the overall Iter Project that must be borne by one or more of the Parties.

As described in detail in Sections 5, 7, 8 and 10 of this Plan, the Clarington site meets or exceeds all the technical, social, regulatory and community requirements for hosting Iter. The proposed Clarington site is approximately 60 km east of downtown Toronto, on the shore of Lake Ontario. It is adjacent to the present site of the Darlington Nuclear Generating Station, operated by Ontario Power Generation (formerly Ontario Hydro). The existing nuclear station, designated "Darlington A", consists of four CANDU reactor units, each producing about 880 MWe. Because Darlington A is a large generating facility, it is a major node on the Ontario electrical supply grid.

The Darlington site was developed by Ontario Hydro, and was originally prepared for two four-unit stations. The second station, "Darlington B", which was to have been a duplicate of Darlington A, was never built.

[1] The Competitive Alternatives – G7 Edition - A Comparison of business costs in North America, Europe and Japan: KPMG, March 1999

The Clarington Site for Iter has been created by dividing the existing 489 hectare Darlington site into two parts - the area of the Ontario Power Generation Darlington A site comprising 308 hectares, and the Iter site of 181 hectares. Significant site preparation work has been done at the proposed Iter site, as it was previously used for the laydown and construction support area during the construction phase of the Darlington A station. Also as noted previously, the Clarington site has a fully developed and proven road, rail, air and ocean transportation infrastructure. All of this prior infrastructure development work confirms the acceptability of this as an appropriate site for Iter.

Of significance to the Iter project is that the Ontario Power Generation Darlington site also includes the Darlington Tritium Removal Facility. This facility is used by Ontario Power Generation to recover by-product tritium from the heavy water used as the reactor moderator and coolant in all of Canada's commercial CANDU reactors. The current inventory of tritium is stored in a vault within the Tritium Removal Facility. This means the costs of transporting tritium, including the approval process, to the Iter site will be much lower than for any other potential site.

The licensing process underway for approving the siting of Iter at Clarington is described in detail in Section 7 of this Plan. It suffices at this time to say that the Clarington Site should meet all the requirements of the Canadian regulator, and could be licensed to site and construct Iter, prior to the signing of the necessary agreements for Iter Canada to host Iter.

In summary, considering the value of the existing physical site and infrastructure, combined with the value added activities of Iter Canada described in Section 5.2.1., the non-Canadian Iter Parties will avoid individually, or collectively, approximately US $1 billion in costs, if Clarington is chosen as the site for Iter. ***In current Canadian dollars this is equivalent to Cdn $1.5 billion.***

12.8.2. **Host Scope during Construction:** The scope being undertaken by Iter Canada during the Construction Phase, over and above the site and site preparation costs noted above, is defined in detail in Section 5.2.2. and 5.5 of this Plan. As with the site costs noted above, these Construction Phase costs would need to be budgeted and paid for by the non-Canadian Iter Parties, if Iter was constructed outside of Canada.

The Iter Canada scope for just this defined "non-transportable" portion is approximately 460 kIUA. ***In current Canadian dollars this is equivalent to Cdn $960 million.***

12.8.3. **Other Equipment Installation Costs:** The basis of the Iter Canada Plan is that the installation costs for the equipment and systems is not part of the basic Iter Canada host scope, with the exception of the tokamak Machine Assembly which is included in the Iter Canada scope of the Plan (Section 5.2.2.). The costing and responsibility for the non-tokamak installation and commission scope is logically with the Iter Party providing the equipment as part of their Construction Phase responsibility to the Iter Project. Only the supplier of this scope will have the understanding and expertise to define the related installation and commissioning scope and cost.

The Procurement Package program determined this cost of installing the equipment by the various Iter Parties, although the estimates will be as though the equipment was being installed in the country of the equipment manufacturer. However, the expectation is that the responsible supplier of the equipment will enter discussions with Iter Canada's industrial partners engaged in the other site activities, to make commercial arrangements for the supply of the required site labour to carry out the installation work. The responsibility for providing installation and commission supervision, and hence a direct control of the work scope, would be from the equipment supplying Party. This approach has worked well on international and domestic projects undertaken by the members of the Iter Canada Engineering & Construction Consortium, and we expect would be acceptable to all the Iter Parties.

While the costs for doing this work cannot be precisely defined due to the unknowns in the quantity of labour and local materials required, the ITER FEAT costing analysis in 1999 indicated that this scope was valued at approximately 167 kIUA. The cost savings to the Iter Parties to have this work done at a Canadian site can be estimated using recognized international labour indices. Using the basic kIUA value as being the cost in the USA (a reasonable middle range cost country), the relative cost factors between Canada and the USA for labour and benefits for the equipment installation, is 0.68[2]. Taking this as the basis of comparison, the cost savings to the Iter Parties of having the installation and construction work conducted in Canada is the equivalent of approximately 53 kIUA. ***In current Canadian dollars this is equivalent to a Cdn $110 million cost savings to the Iter Parties.***

12.8.4. **Project Changes and Schedule Changes:** The costs associated with project scope and schedule changes will be borne by the Iter Parties as described in Section 9.2.4. These costs will be significantly lower to the Iter Parties with Iter being sited in Canada, than if it were sited

[2] The Competitive Alternatives – G7 Edition - A Comparison of business costs in North America, Europe and Japan: KPMG, March 1999 – Exhibit I-9, Page 6 – SEE Attachment 12-A.

elsewhere. The unit cost savings will be similar to those defined above for equipment installation work, but at this time there is no way of estimating the overall magnitude of any anticipated changes. Therefore, for this item the cost savings to the Iter Parties has not been estimated, but it could be significant, if the project is subjected to changes during the eight year Construction Phase.

12.8.5. **Canadian Procurement of Common Element Scope:** The non-Host Iter Parties can take advantage of procuring a portion of their allocated in-kind scope of supply in Canada. With the noted overall cost savings of goods and services in Canada, this could be financially beneficial to these Iter Parties. This would also give additional cost savings to the non-host Iter Parties through reduced packing and shipping costs. No specific savings estimate has been done by Iter Canada, but it could be substantial for the Iter Parties.

12.9 SAVINGS TO THE ITER PARTIES DURING THE OPERATING PHASE

There are a number of areas where cost savings will accrue to the Iter Parties during the Operating Phase. Due to the nature of the Iter project some of the defined Operating Phase activities will actually start during the Construction Phase, but are included in this section for clarity.

12.9.1. **The Host Services Contract:** The Host Service Agreement will be structured to ensure the Iter Parties obtain at least a 10% savings over the Iter budgeted amount during the Operating Phase of the project for the scope of work included in the Host Services Contract.

Using the draft ITER Final Design Report cost value of 188 kIUA per annum for the collective estimated budget for Project Personnel, Electricity, Tritium Consumption, and Capital Improvements, Maintenance and Spare Parts, the total cost for the 20 year operating phase of the Project is 3760 kIUA. A 10% savings would total approximately 376 kIUA. ***In current Canadian dollars this is equivalent to a Cdn $782 million cost savings to the Iter Parties.***

12.9.2. **Canadian Seconded Scientists:** Iter Canada's Plan to host Iter includes providing 20 (ie. 10%) of the long term seconded scientists/professionals to the Iter Project at no cost to the Iter Parties.

As these scientists/professionals will be performing required roles within the overall Iter Legal Entity Operating Phase research program, the other Iter Parties will not need to provide these professionals. Using the Iter costing rate of 150 IUA for each professional, this Iter Canada contribution gives a savings to the Iter Parties of approximately 60 kIUA

over the operating phase. ***In current Canadian dollars this is equivalent to a Cdn $125 million cost savings to the Iter Parties.***

12.9.3. **Foreign Seconded Scientists and Technical Personnel:** While it is expected that the foreign secondments and visiting scientists will be fully paid for by their home countries, the cost of supporting these professionals will be significantly lower in Canada. This will be a direct cost benefit to the Iter Parties. These savings have not been estimated, but would be substantial.

12.10 SUMMARY OF THE TOTAL SAVINGS TO THE ITER PARTIES

The following Table 12.1 summarizes the total **Cdn $3.5 billion cost savings** to the Iter Parties using the best available Iter kIUA costs as the basis for comparison.

TABLE 12.1
COST SAVINGS BASED ON THE kIUA ANALYSIS and KPMG COMPARISON OF BUSINESS COSTS
(Millions of Year 2000 Canadian Dollars)

FACTOR	SAVINGS TO THE ITER PARTIES
Construction Phase	
Site and site infrastructure	1500
Host construction scope	960
Equipment installation	110
Project Changes	not estimated
Non-host procurement in Canada	not estimated
Operational Phase	
Host Services Contract scope	782
Canadian scientists provided	125
Support of foreign secondments in Canada	not estimated
TOTAL SAVINGS	**Cdn $3477+ millions**

If the more specific relative costs in Japan and France were considered in this analysis, the cost savings would be substantially different. To illustrate, if the kIUA factor is considered as the cost of conducting these activities in the USA, the relative costs between Canada, France and Japan are 92.2, 104.2 and 121.9 for annual operating costs, and 83.7, 87.4 and 625.1 for buildings costs[3]. Factoring the cost savings shown in Table 12.2 with these factors results in the following overall cost savings compared specifically to a siting of Iter in Japan or France. No assumptions have been made on the cost allocations of these additional costs to either Japan or the EU.

TABLE 12.2

COST SAVINGS FOR ITER IN CANADA COMPARED TO JAPAN OR FRANCE BEING HOST

(Millions of Year 2000 Canadian Dollars)

FACTOR	SAVINGS COMPARED TO FRANCE ASS HOST	SAVINGS COMPARED TO JAPAN AS HOST	COMPARATOR
Construction Phase			
Site and site infrastructure	1566	1500*	Investment Land costs
Host construction scope	1002	7170	Buildings costs
Equipment installation	189	209	Labour & Benefits costs
Project Changes	not estimated	not estimated	
Non Host procurement in Canada	not estimated	not estimated	
Operational Phase			
Host Services Contract scope	991	1303	Annual costs
Canadian scientists provided	215	238	Labour & Benefits costs
Support of foreign secondments in Canada	not estimated	not estimated	
TOTAL SAVINGS: Iter in Canada compared to other countries	***Cdn $3963+ millions***	***Cdn $10420+ Millions***	

* Not factored (Used base kIUA factor – Table 12.1)

[3] The Competitive Alternatives – G7 Edition - A Comparison of business costs in North America, Europe and Japan: KPMG, March 1999 – Exhibit I-9, Page 6

As can be seen from this analysis, the overall cost savings to the Iter Parties will be more than Cdn $4 billion, if Iter is hosted by Canada rather than built in France, and more than Cdn $10 billion, compared with Iter being built in Japan. Expressed another way, if Iter is built in France, the participating countries will need to budget an additional Cdn $4 billion compared to the budget needed if Iter is built in Canada. If Iter is built in Japan, the comparable additional budget required would be Cdn $10 billion.

12.11 ATTACHMENT

12-A: Exhibit I-9 from "The Competitive Alternatives – G7 Edition - A Comparison of business costs in North America, Europe and Japan", KPMG, March 1999

ATTACHMENT 12-A

Exhibit I-9 from "The Competitive Alternatives – G7 Edition - A Comparison of business costs in North America, Europe and Japan", KPMG, March 1999

Comparison of total annual costs – nine industry average, by cost component, US $,000

	Austria	Canada	France	Germany	Italy	Japan	UK	US
Initial Investment Costs*								
Land	5,828	934	1,417	6,397	1,484	29,651	3,219	987
Buildings	5,144	2,325	2,428	5,128	2,471	17,372	4,442	2,779
	10,972	3,259	3,845	11,525	3,955	47,023	7,661	3,766
Rank	**6**	**1**	**3**	**7**	**4**	**8**	**5**	**2**
Annual Costs								
Location-sensitive costs								
- labour and benefits	6,612	3,835	6,598	7,048	6,332	7,312	4,087	5,646
- road freight	184	323	303	300	306	943	204	339
- sea freight	128	109	118	108	92	127	97	165
- air freight	288	52	239	222	245	126	235	55
- electricity	264	132	201	270	302	395	189	174
- lease	73	73	70	69	52	227	153	101
- telecommunications	174	52	99	145	164	153	127	48
- interest	424	304	256	432	324	591	607	351
- depreciation	809	663	669	810	672	1,445	772	688
- property taxes	11	137	287	141	-	923	285	116
- transaction taxes	-	70	-	-	-	-	-	132
- income taxes	427	1,587	562	492	918	49	1,098	878
(effective tax rate)	*32.7%*	*35.7%*	*39.2%*	*n/a***	*51.5%*	*n/a***	*31.2%*	*36.0%*
- other taxes	-	76	-	-	-	59	-	18
	9,394	7,413	9,402	10,037	9,407	12,350	7,854	8,711
Location-insensitive costs								
- other direct costs	5,894	5,894	5,894	5,894	5,894	5,894	5,894	5,894
- other indirect costs	2,005	2,005	2,005	2,005	2,005	2,005	2,005	2,005
	7,899	7,899	7,899	7,899	7,899	7,899	7,899	7,899
Total annual costs	**17,293**	**15,312**	**17,301**	**17,936**	**17,306**	**20,249**	**15,753**	**16,610**
Cost advantage in comparison to the US	**-$683**	**$1,298**	**-$691**	**-$1,326**	**-$696**	**-$3,639**	**$857**	**$0**
Index (US= 100.0)	**104.1**	**92.2**	**104.2**	**108.0**	**104.2**	**121.9**	**94.8**	**100.0**
Rank	**4**	**1**	**5**	**7**	**6**	**8**	**2**	**3**