

ILC EDR Kick Off Meeting

Conventional Facilities and Siting

Asian Regional Team

- Project Status and EDR Planning -

Atsushi Enomoto (KEK)

ILC EDR CFS-Asia Kick Off Meeting

10-11 September 2007, KEK

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- ***GDE-CFS Activity***
- ***CFS in RDR and Asian Region Specific Points***
- ***Expected Schedule of CFS in Japan***

GDE-CFS Activity

GDE CFS Group

- 1-hour Meeting every Tuesday since 2005.10 -

- **Asia**

- (KEK) **Atsushi Enomoto, Ryuhei Sugahara, Masami Tanaka**
- (Consultant) **Nikken Sekkei Ltd.**

- **Americas**

- (FNAL) **Vic Kuchler, Tom Lackowski, Emil Huedem, Larry Hammond, Maurice Ball, Richard Ford, Ron Jedziniak, Jerry Leibfritz, Jim Niehoff, Gary Van Zandbergen, Steve Wesselin, Mark Ross,**
- (Consultant) **Hanson Engineering**
- (SLAC) **Fed Asiri, Clay Corvin, Gerry Aarons, Jonghoon Kim, Keith Jobe, Robert Ruland,**
- (Consultant) **John Cogan**
- Others: (ANL) **Horst Friedsam (JLAB) Will Oren**

- **Europe**

- (CERN) **Jean-Luc Baldy, John Pedersen, Michael Poehler, Jean-Pierre Quesnel, Ingo Ruehl, Martin Gastal, Nigel Baddams**
- (Consultant) **AMBERG**
- Others: (University of Oxford) **Armin Reichold, (DESY) Markus Schlösser, (BINP)**

Tsukuba

9 pm: summer
10pm: winter



Chicago
7 am



San Francisco
5 am



Geneva
1 pm

Asian CFS Team in BCD/RDR Activity

Consultant

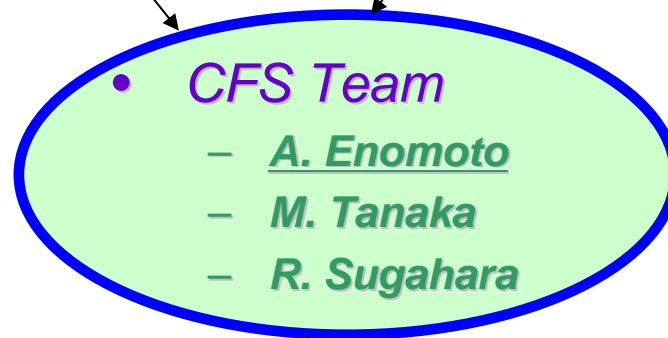
Nikken Sekkei Ltd.

**Design
& Cost Data**

**Review & Assist
for Estimation**

KEK

**Plant & Facilities Department
Site Investigation Committee**



Technical Review & Comments

Collaboration

**Linear Collider Forum of Japan
Japanese Society of Civil Engineering**

Reference Design Report

Reference Design Report



<http://ilc.kek.jp/RDR/>

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RDR CFS Design Aspect

As the base of CFS design work, common CFS criteria were derived from Area groups.

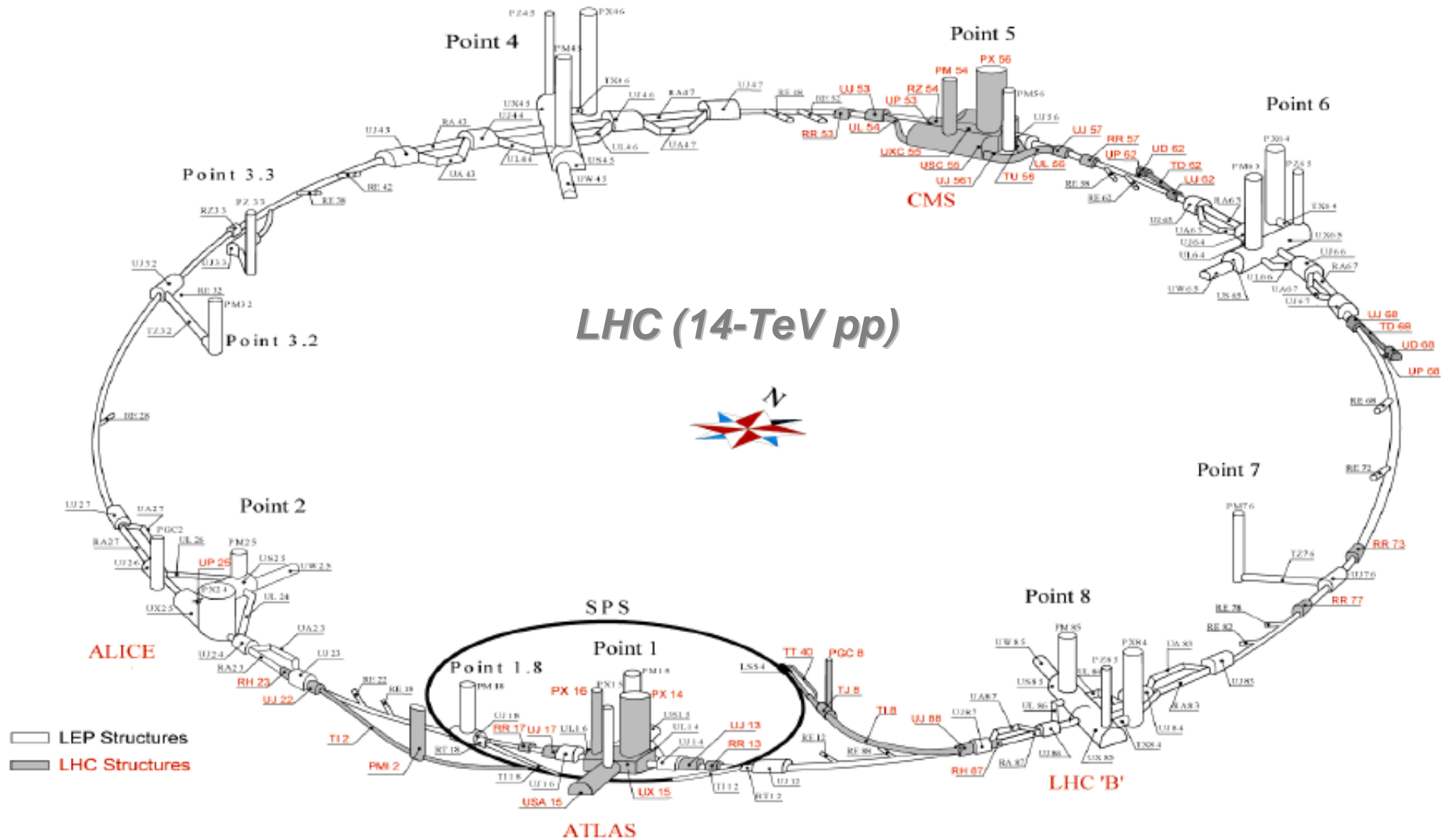
Site specific parts of the CFS design work were developed by each three sample sites.

= Civil, and High-voltage Electricity

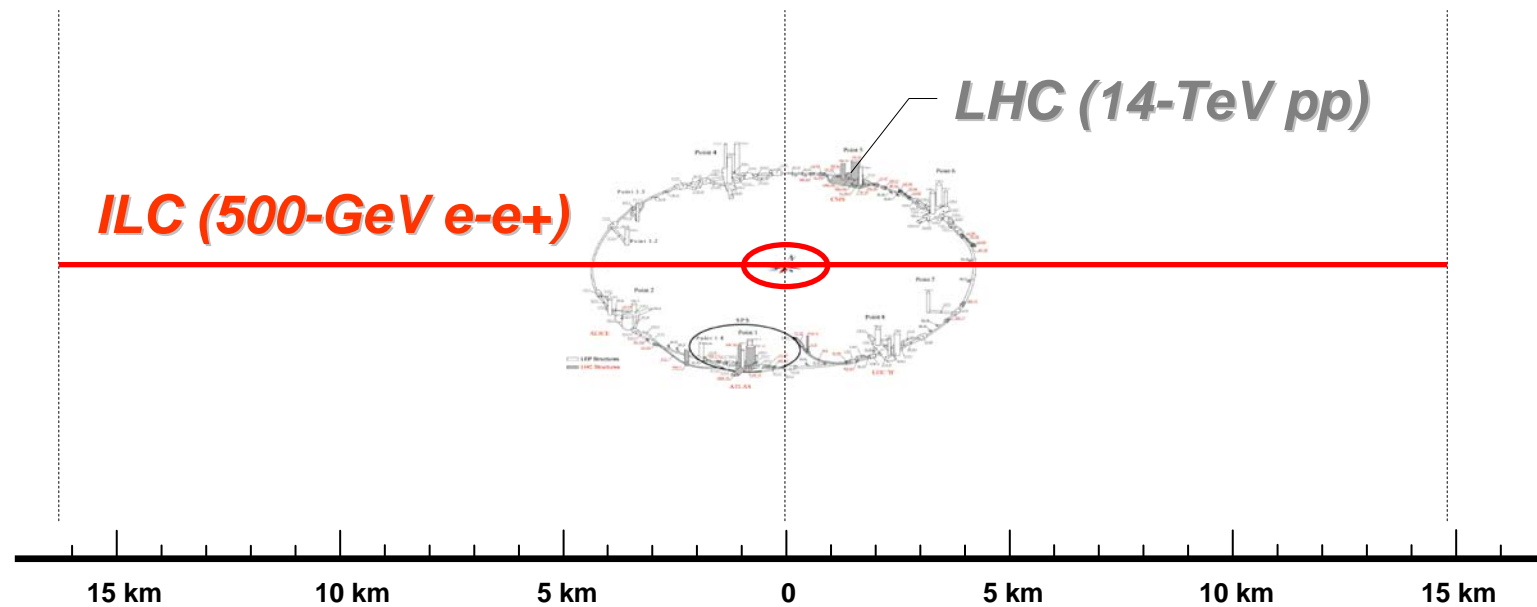
Others were treated as site independent and shared among three regions in RDR.

Site specific civil costs basically estimated by unit costs, made different total costs but they are almost same, taking account of variable currency exchange rate.

How Large is the ILC Conventional Facility?

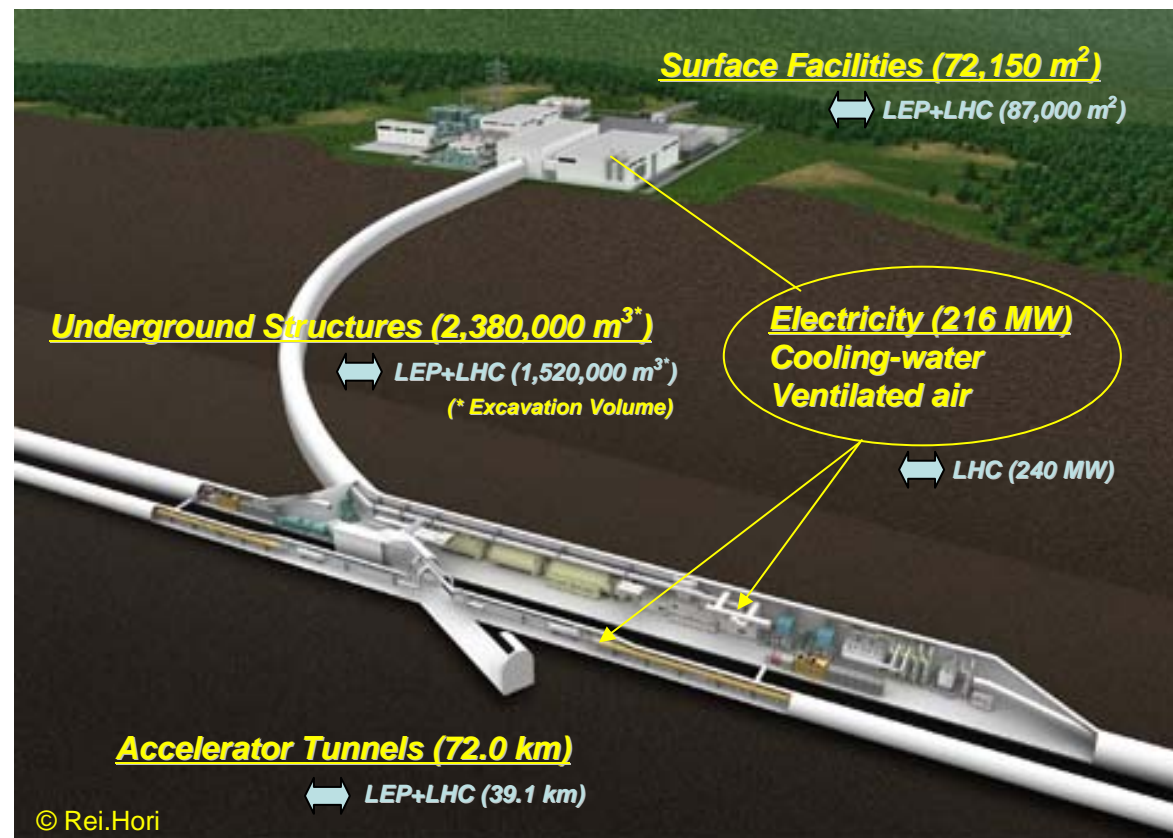


How Large is the ILC Conventional Facility?



Comparison of CF sizes between ILC and LHC

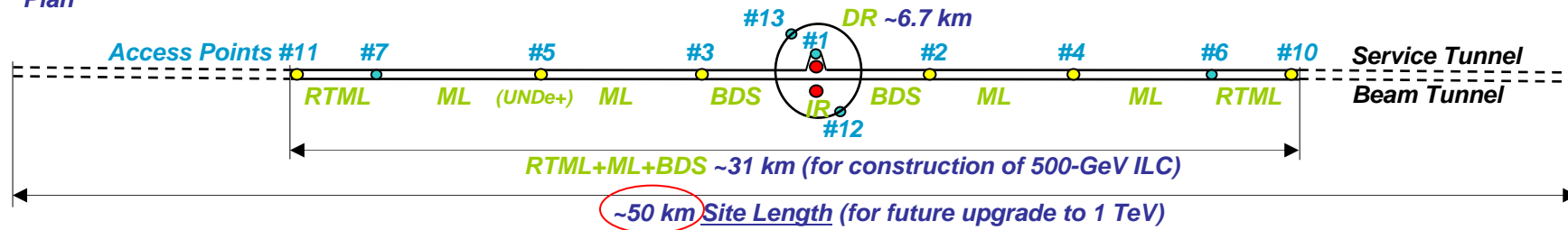
- Accelerator conventional facility is composed of
 - underground tunnels accessed from surface facilities with shafts
 - and equipment which provides accelerators with electricity, cooling-water, and ventilated air.



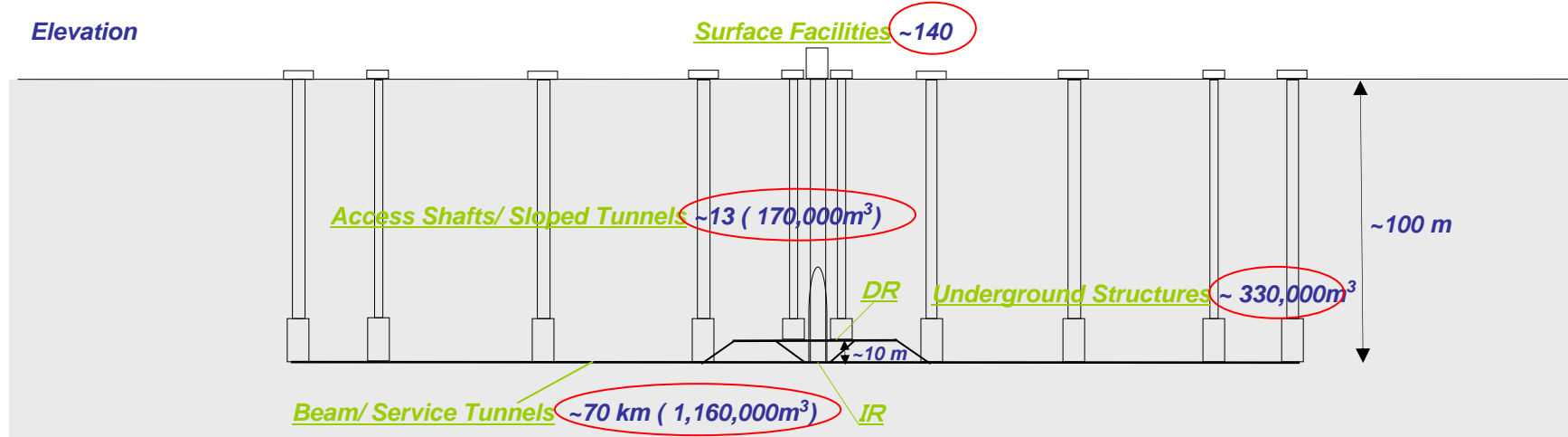
Civil Works

- Civil Engineering
 - Surface, Access, Underground

Plan



Elevation

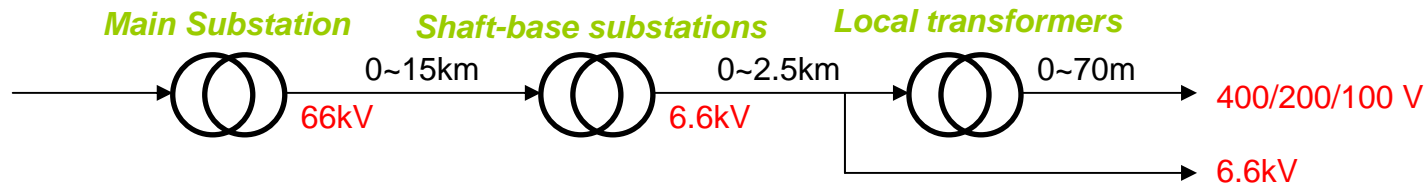
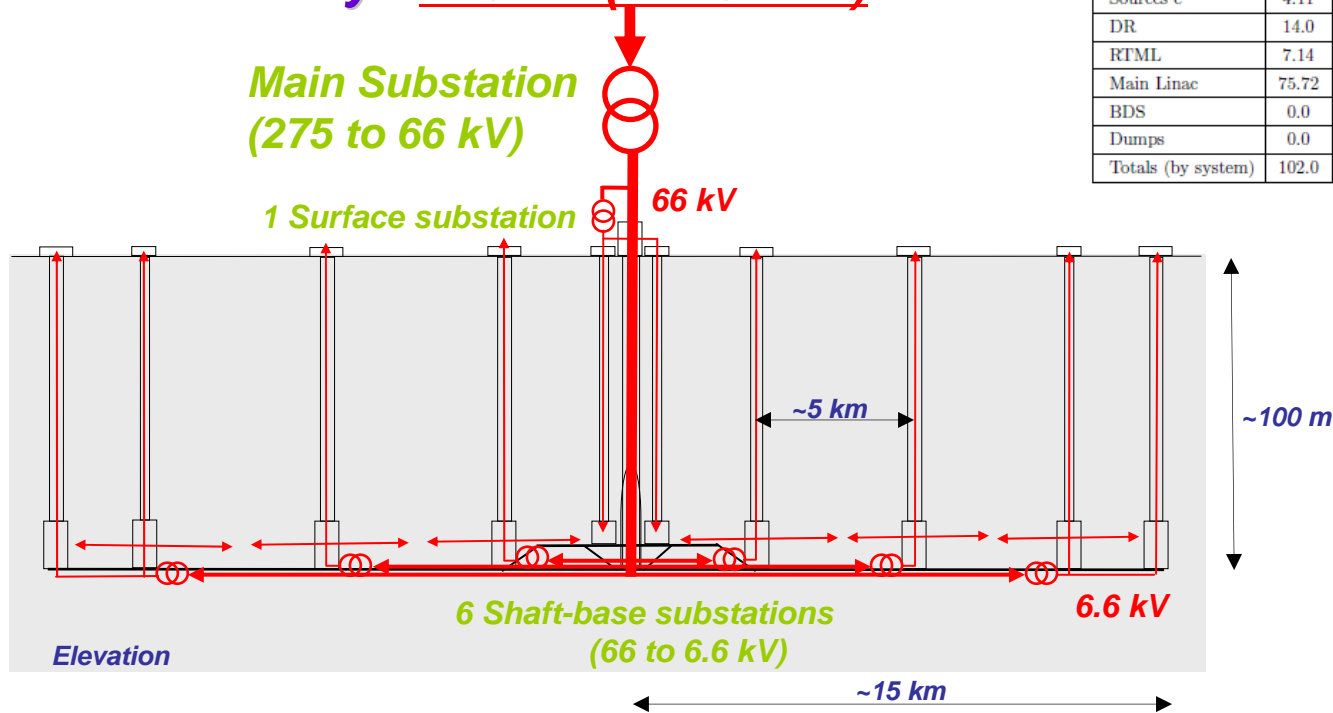


Electric Power Distribution

- Electricity **275 kV (~220 MW)**

Estimated nominal power loads (MW) for 500 GeV centre-of-mass operation

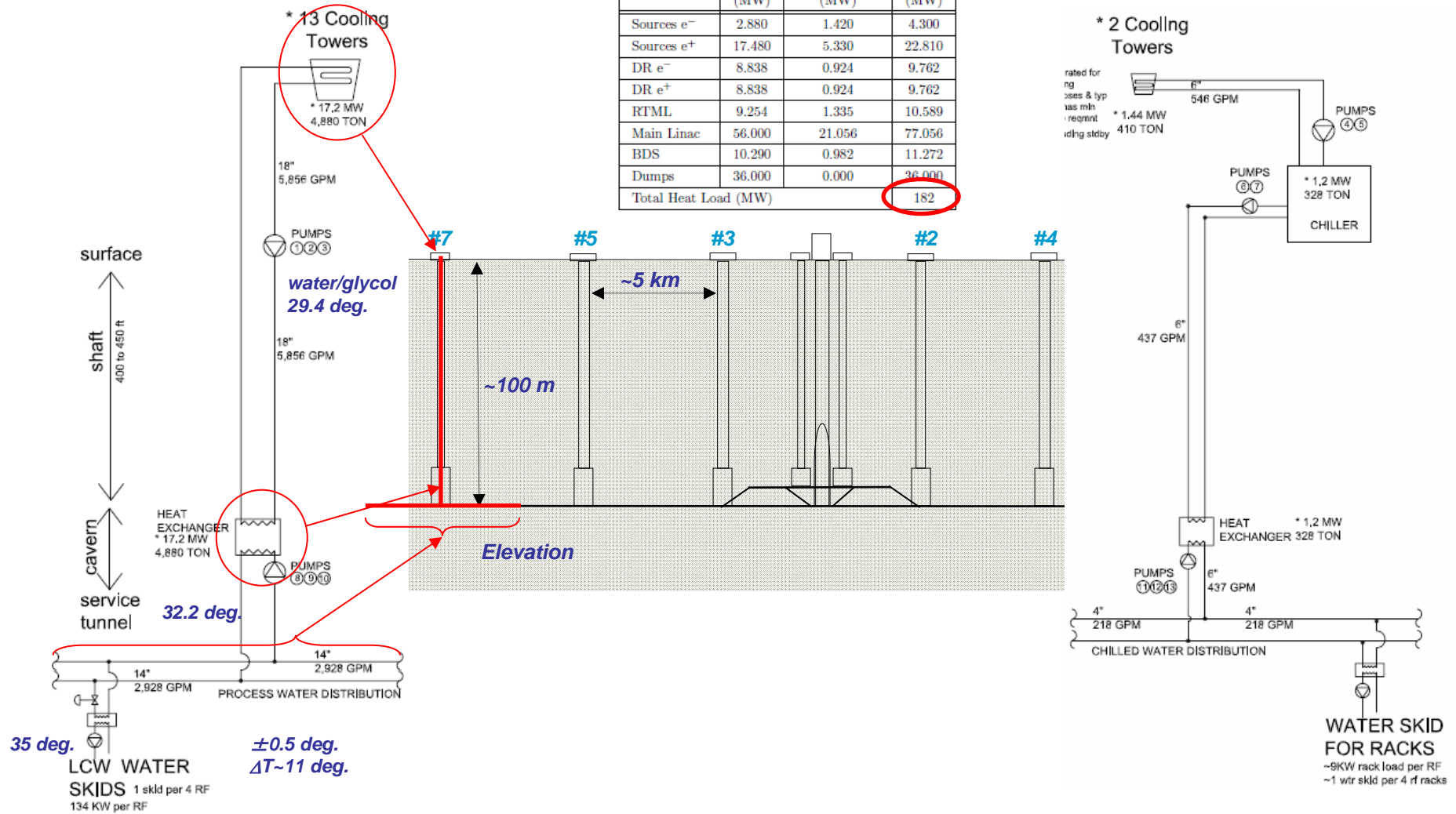
Area System	RF Power	Conventional Power				Emer Power	Total (by area)
		Conv	NC Magnets	Water Systems	Cryo		
Sources e ⁻	1.05	1.19	0.73	1.27	0.46	0.06	4.76
Sources e ⁺	4.11	7.32	8.90	1.27	0.46	0.21	22.27
DR	14.0	1.71	7.92	0.66	1.76	0.23	26.29
RTML	7.14	3.78	4.74	1.34	0.0	0.15	17.14
Main Linac	75.72	13.54	0.78	9.86	33.0	0.4	134.21
BDS	0.0	1.11	2.57	3.51	0.33	0.20	7.72
Dumps	0.0	3.83	0.0	0.0	0.0	0.12	3.95
Totals (by system)	102.0	32.5	25.6	17.9	36.0	1.4	216.3



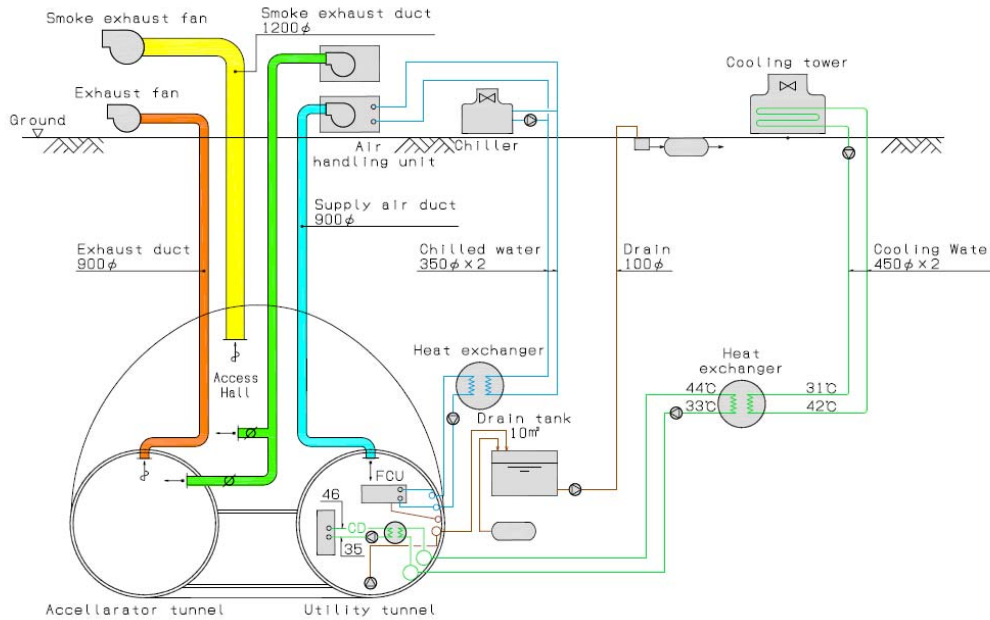
Cooling Water Distribution

Summary of heat loads broken down by Area System

Area System	LCW (MW)	Chilled Water (MW)	Total (MW)
Sources e ⁻	2.880	1.420	4.300
Sources e ⁺	17.480	5.330	22.810
DR e ⁻	8.838	0.924	9.762
DR e ⁺	8.838	0.924	9.762
RTML	9.254	1.335	10.589
Main Linac	56.000	21.056	77.056
BDS	10.290	0.982	11.272
Dumps	36.000	0.000	36.000
Total Heat Load (MW)			182



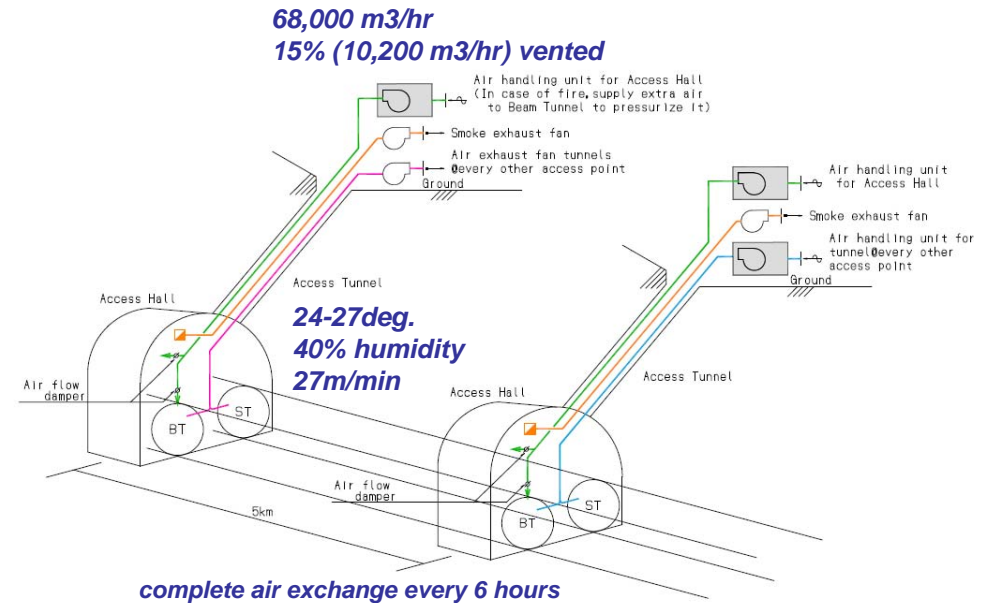
Air Ventilation



Schematic diagram of HVAC system

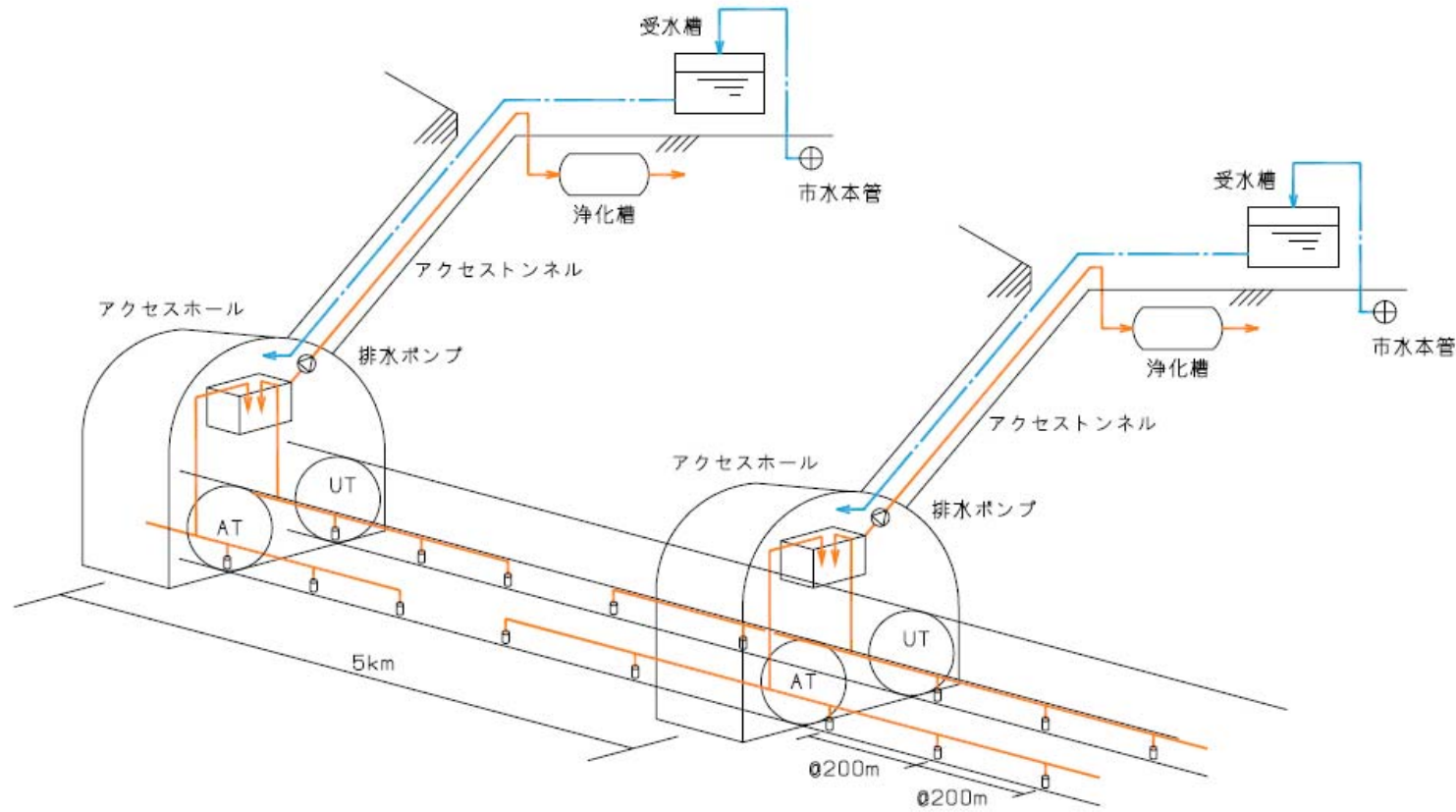
HVAC requirements

Location	Temperature (drybulb)	Dewpoint	RH	Air Flow
e- Source	29°C	<13°C	<35%	27 m/min
Damping Ring	40°C	<13°C	<20%	27 m/min
Main accelerator service tunnel	29°C	<13°C	<35%	27 m/min
Main Linac beam tunnel (not contr.)	>30°C	<13°C	<35%	27 m/min
BDS beam tunnel	29-32°C	<13°C	<35%	27 m/min
IR hall	29-32°C	<13°C	<35%	27 m/min



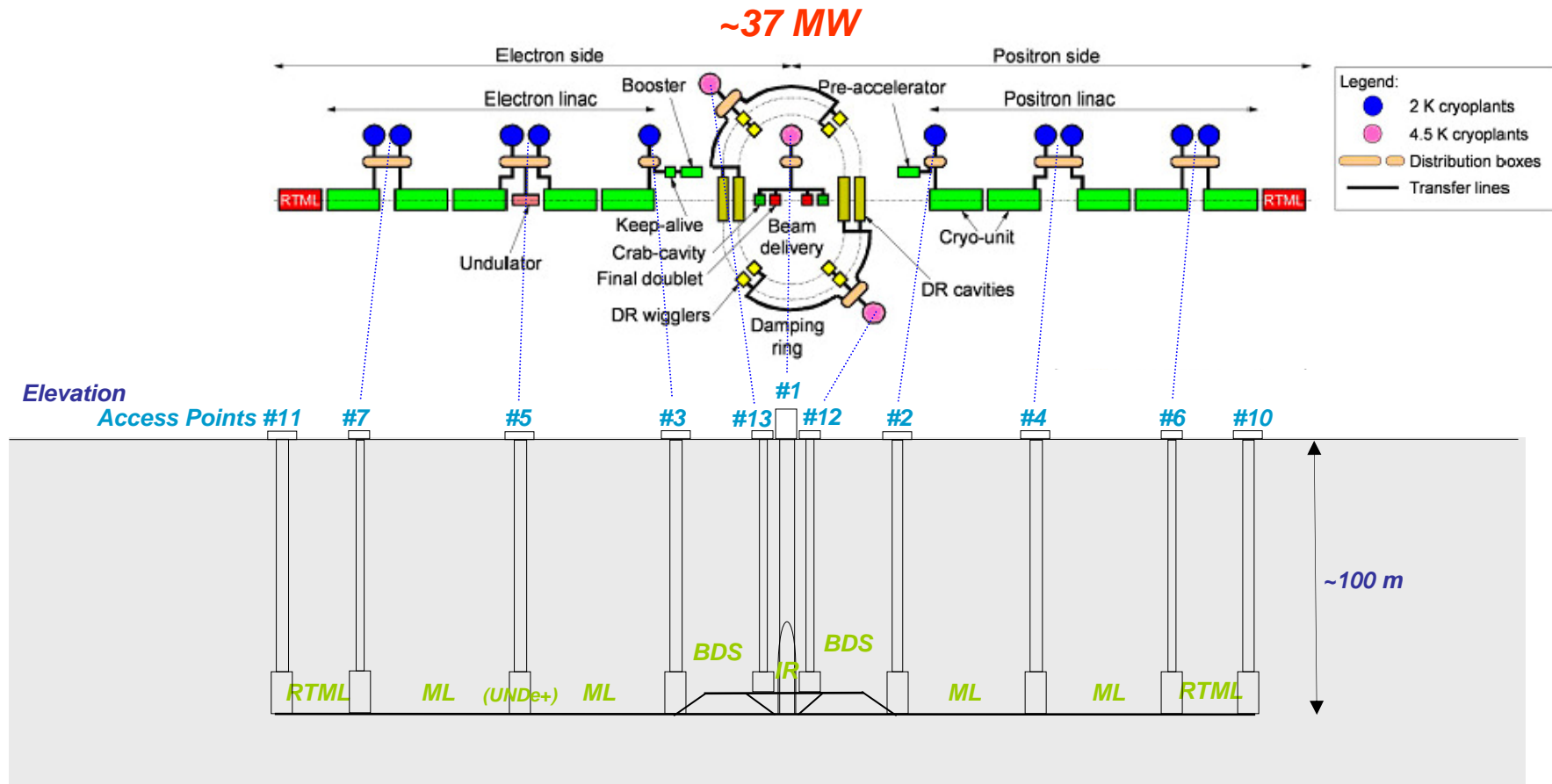
HVAC & SMOKE EXHAUST SYSTEM

Potable water and drainage system



トンネル給排水概念図

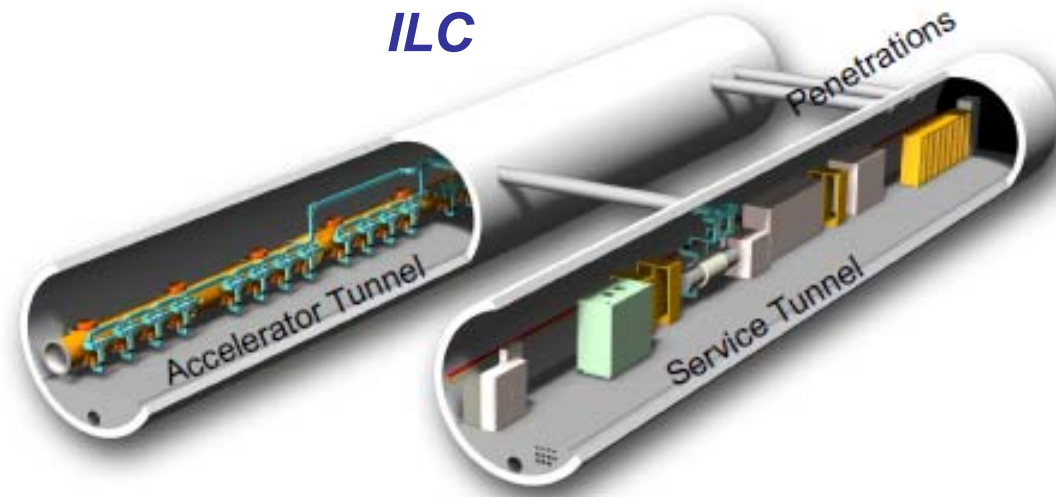
Cryogenic system



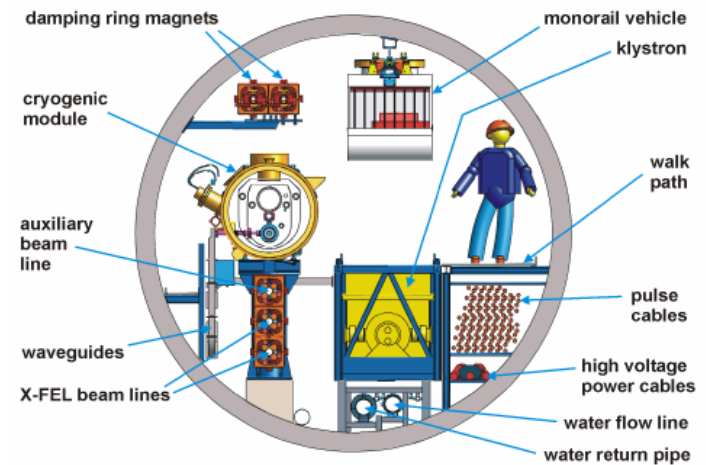
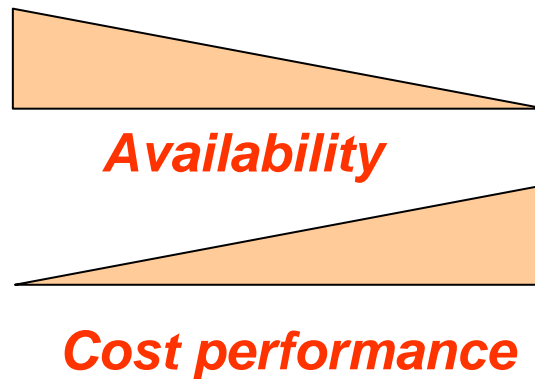
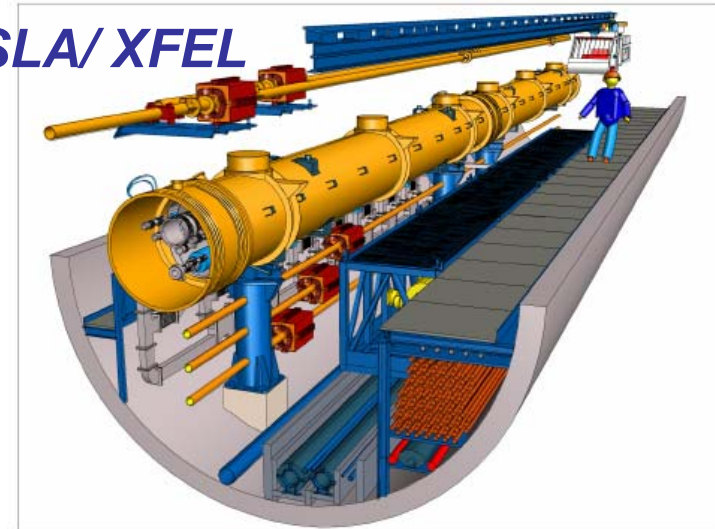
Civil Works and Asian Specific Point

Accelerator Tunnels

- 1-tunnel scheme vs 2-tunnel scheme

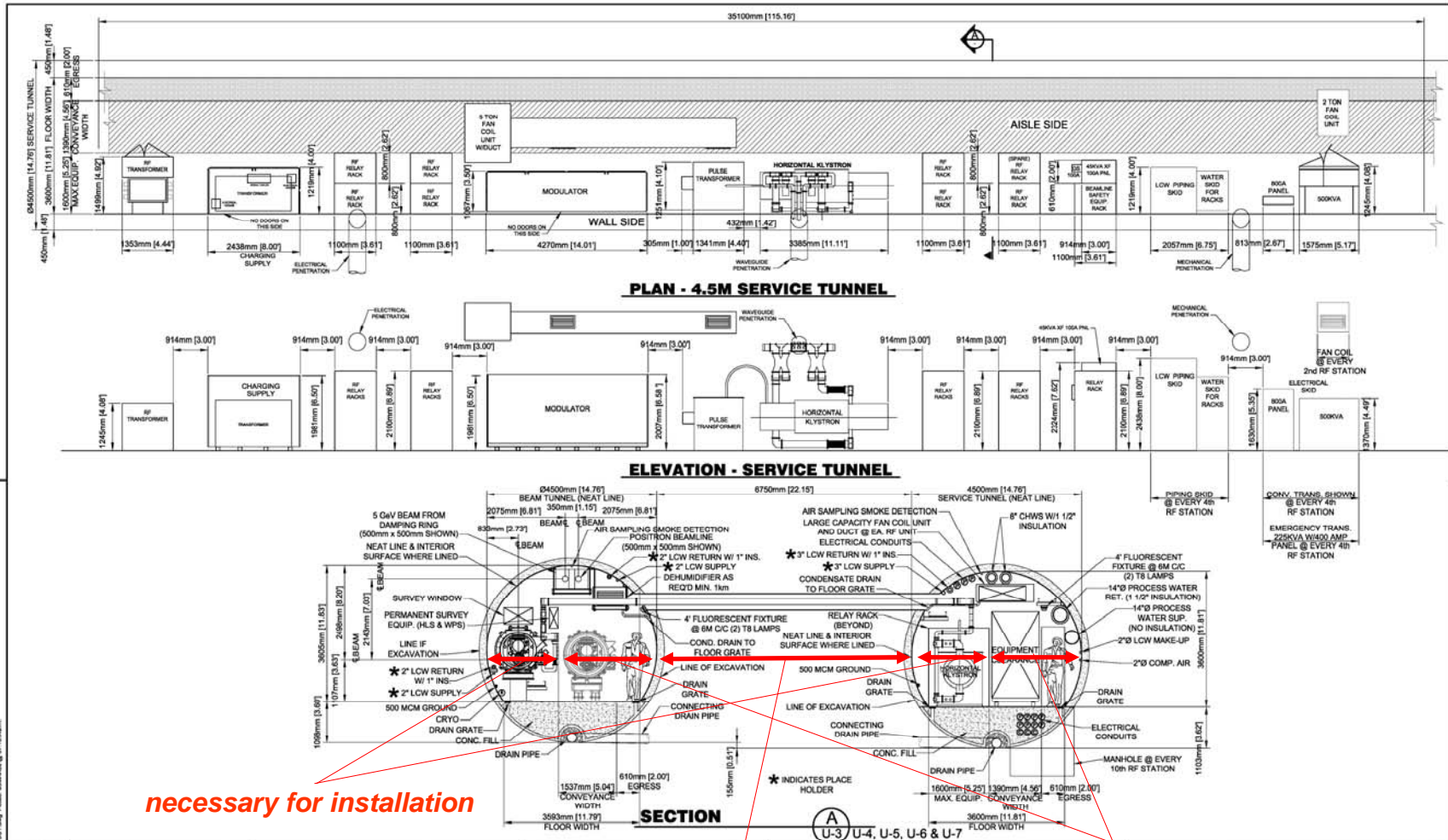


TESLA/ XFEL



(From TESLA Design Report)

Main Linac Tunnel



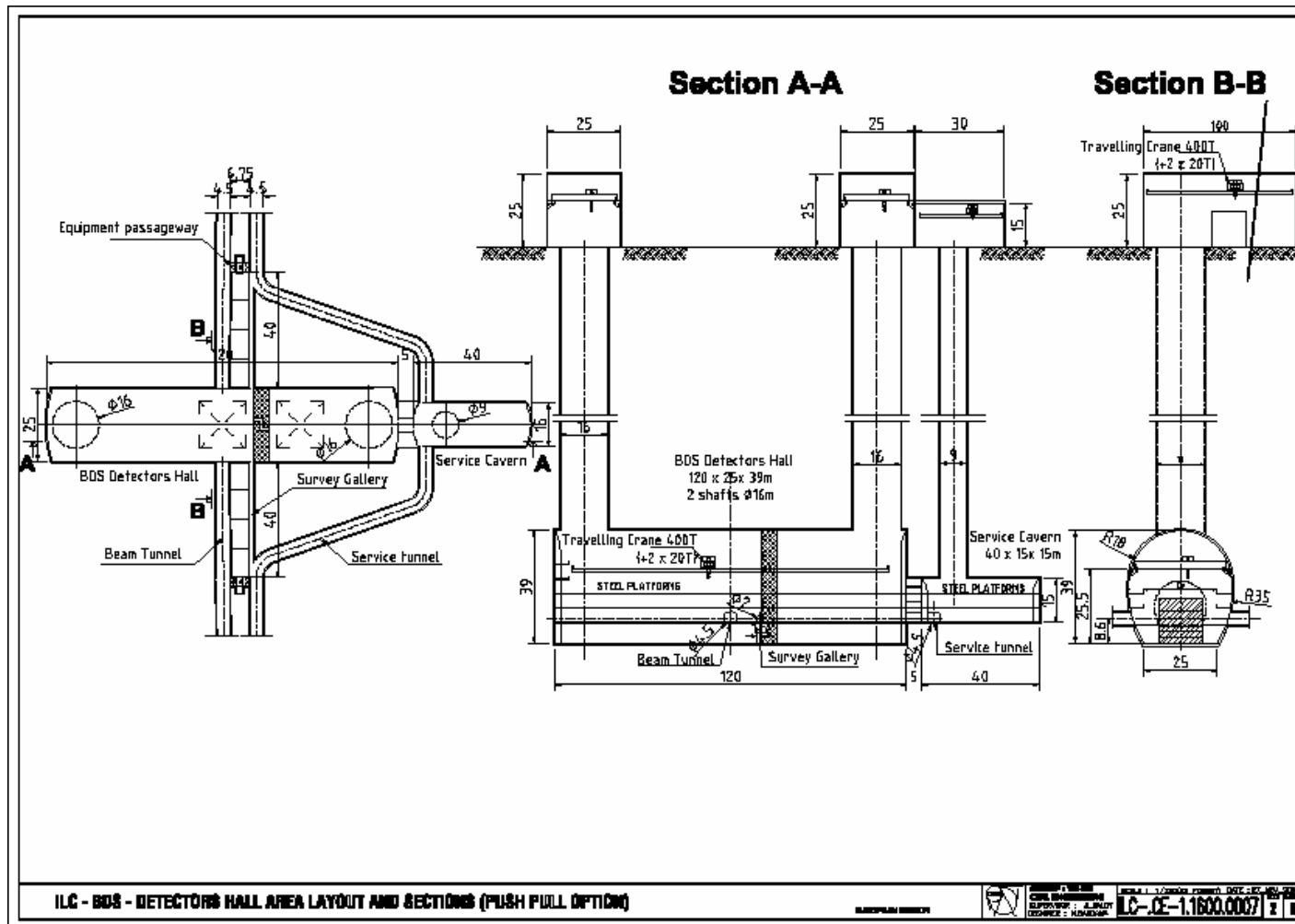
necessary for installation

~1.5 x tunnel diameter, necessary for maintenance, emergency egress
 necessary for excavation, enough for radiation shield

- How were the dimensions determined?
 - Length, diameter, distance between tunnels,
- How are the accelerator components located?
 - Cryomodule, klystron,

• Sub-sub-subtitle

Detector Hall



Site Features

TABLE 5.5-1
Summary of notable features of the sample sites and construction methodology.

Subject	Americas Region	Asian Region	European Region
Sample site location	Northern Illinois – near FNAL.	Japan	Geneva Area – near CERN
Land features	200 ~ 240m above sea level	120 ~ 680 m above sea level	430 ~ 480 m above sea level
Geology	Dolomite	Granite (sedimentary rock in phase-2 extension)	Molasse (sedimentary rock / sandstone)
Tunnel depth from surface	100 ~ 150m	40 ~ 600 m	95 ~ 145m (except 1 valley 30 m)
Access paths to underground caverns	13 shafts 9m, 14m, 16m diam 100 ~ 135 m deep	10 sloped tunnels (7.5m × 7m × 700 ~ 2000m) and 3 shafts (for IR)	13 shafts 9m, 14m, 16m diam 100 ~ 135m deep
Tunnel construction	TBM	TBM	TBM
Tunnel lining	20% of length shotcreted	100% of length shotcreted	100% of length precast concrete segments
Average tunnel excavation speed	30m/day/TBM (boring)	16m/day/TBM (boring + surface work)	25m/day/TBM (boring)
Number of TBMs	9	15 (6 out of 9 accesses have two TBMs starting in opposite directions)	9
Cavern construction	Drill and blast	Drill and blast (NATM)	Road breaker /header
Shaft construction	Earth excavation / Drill and blast	Drill and blast (step by step method)	Road breaker/header (Moroccan method)
New surface buildings	92	166	120
Distribution voltage	69/34 kV	66/6.6kV	36kV

Asian Specific

- **Site located in mountain area**
 - *Sloped tunnels are mainly used for access to the underground tunnels and caverns. (T. Kato's talk)*
- **Most likely tight geology**
 - *For stable experiment condition. (R. Sugahara's talk)*
 - *Use more TBMs due to slower expected tunneling speed. (H. Chikahisa's talk)*
 - *Need less support or lining than in soft geology, recovering cost and time. (N. Shikama's talk)*
 - *But anyway, the most important thing is the investigation to choose smooth geology. (H. Oshima's talk)*

EDR Planning

ACURRENT PROJECT STATUS プロジェクトの現況 - 1

- **The following analysis was made by the CFS Asian team but not yet assessed.**
- **Additional presentations related to CFS EDR scheduling:**
 - **T. Tsunematsu, ITER Site Selection**
 - **H. Oshima, Site Investigation**
 - **M. Yoshioka, TRISTAN-KEKB, JPARC Experience**
 - **R. Sugahara, Technical Issues on Site Selection**

1. SITE SELECTION 敷地選定

- **Site has not been selected yet. Sample Site is not necessary the final site.**

敷地は未決定である。RDRで採用したサンプルサイトは必ずしも最終敷地ではない。

➡ **Narrowing the potential sites is essential for the Asian CFS group to proceed EDR.**

EDRを進めるに当たって、サイト候補地の絞り込みがCFSアジアグループにとって不可欠である。

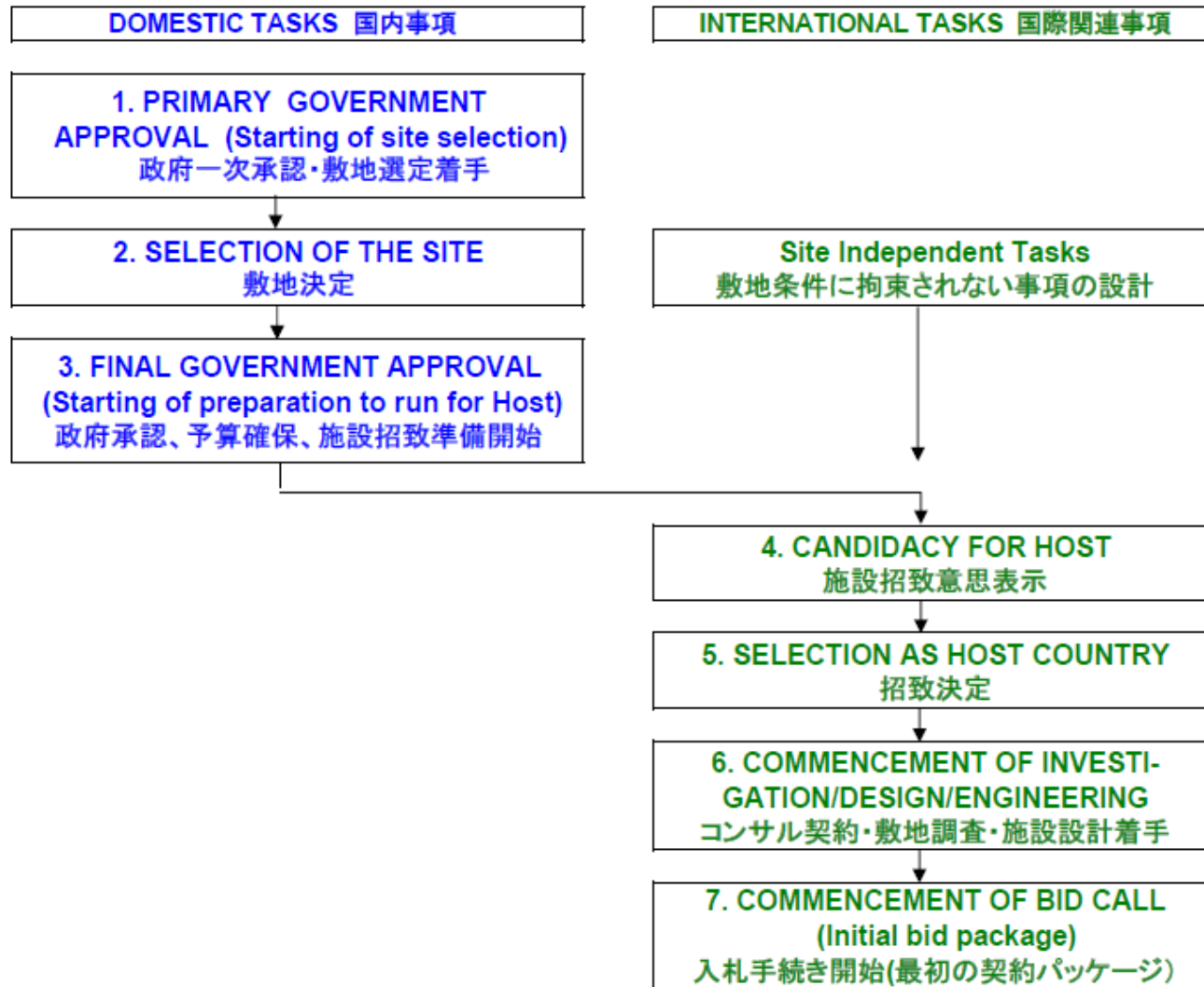
2. GOVERNMENT APPROVAL 政府承認

- **Not yet granted. Resources for further R&D and engineering development prior to the approval is restricted**
政府承認は未だ与えられていない。承認以前のR&D や施設設計に使える財源には制約がある
- **Presumably, two step approval**
承認は2段階で与えられのではないか
- **Primary approval by the Ministry for exercise of site selection**
文部科学省の一次承認によって敷地選定を進めることが可能になるのではないか
- **Final approval by the Cabinet and Parliament for running to host**
閣議・議会承認によって、ILCに対して敷地招致の意思表示を行うことが可能になるのではないか

3. KEK PROJECT 進行中のプロジェクトとの関連

- **ILC will be followed regionally ongoing project**
ILC計画の承認時期は、現在進行中のKEKのプロジェクト完了後となるのではないか
- **And the 3rd Basic Program for Science and Technology (2006-2010) in Japan**
科学技術基本計画も考慮する必要があるのではないか

MAJOR CFS MILESTONE 主要マイルストーン

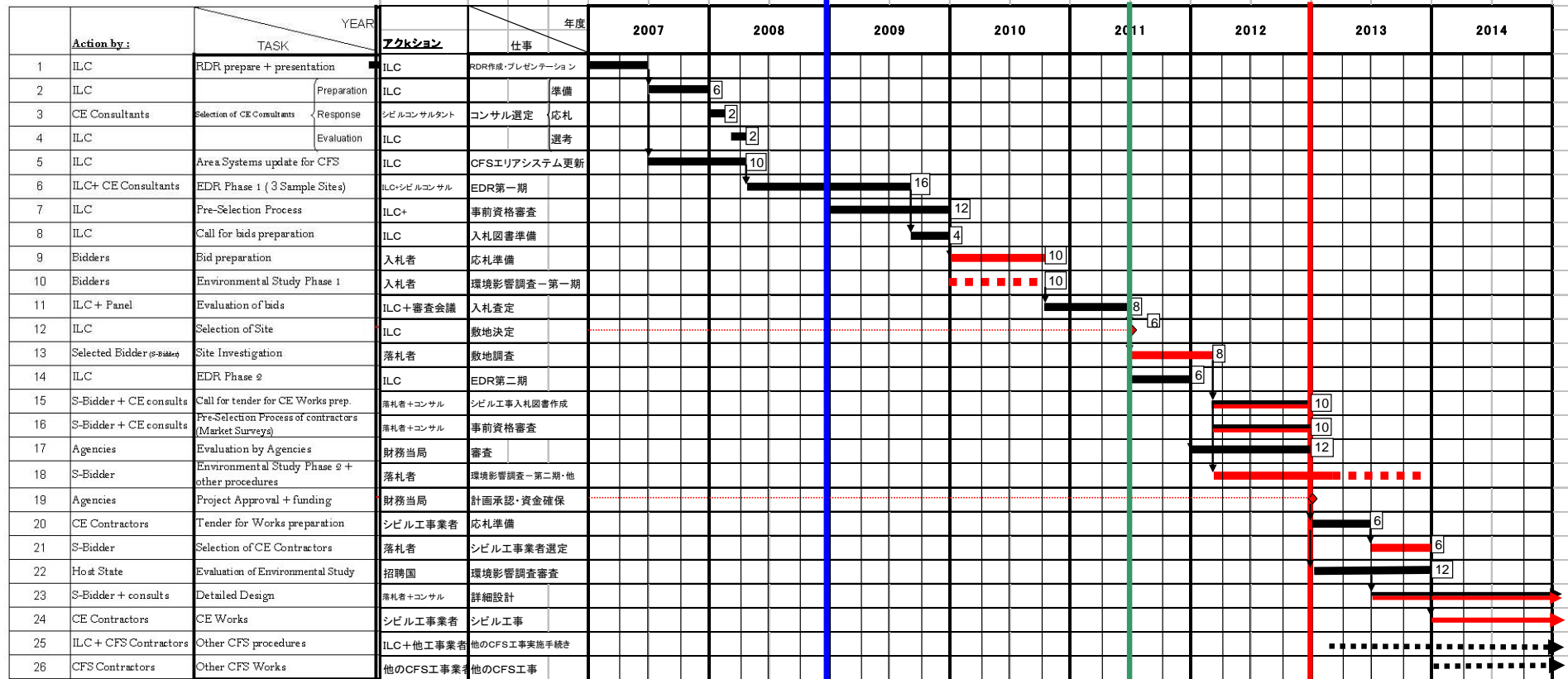


Technical Time Schedule for CFS Design and Works

3 -

ILC のCFS設計及び工事発注スケジュール

22 Aug., 2007



- Notes :**
1. The mentioned 'Actions by bidder(s)' assumes that the Host State manages and provides the financing for (at least) the CE Works in its bid to host. These Actions are highlighted in RED.
 2. Line 11 : Panel of internationally recognised experts will have to be set up to evaluate the bids, rank them and propose a "winner".
 3. Overall management by ILC-GDE-CFS teams which will be necessary at various levels is not systematically mentioned in the action column.
 4. Provided that the overall time span of 7 years from To for construction works and installation is confirmed, this schedule implies start of commissioning at the end of 2013.

CFS Europe - 2 July 2007

CFS Europe - 2 July 2007

Guessed Time Line (Japan) 予想年表(日本)

KEK, Sep. 10, 2007

CFS Planning Procedure up to Bid Call-Asian Region CFS計画スケジュール

		2007	2008	2009	2010	2011	2012	2013	2014	2015
STEP 0	0.1 Preliminary examination of other sites than Sample Site 敷地予備検討		■	■						
	0.2 Limited design development for site independent items 共通事項の技術的検討		■							
	0.3 Preparation of application to the officials concerned 認可申請書類整備		■							
	03 Promotion and lobbying to the officials concerned 政府関係者への働きかけ		■	■						
STEP 1	1. Primary Government Approval 政府一次承認				●					
	1.1 Evaluation of candidate sites 候補敷地(複数)の調査・検討				■					
	1.2 Narrow down the sites to one 候補敷地絞り込み				■					
	1.3 Schematic facility layout 候補地での施設基本レイアウト				■					
	1.4 Preliminary environmental survey 環境影響予備調査				■					
	1.5 Negotiation with local authorities & population 自治体・住民との交渉				■					
STEP 2	2. Selection of the Site 敷地決定					●				
	2.1 Preparation of project scenario & budget 事業計画書・予算書作成					■				
	2.2 Consultation with officials concerned 政府との協議					■				
STEP 3	3. Final Government Approval 政府承認(閣議決定・議会承認)						●			
	3.1 Preparation of bid to host 敷地誘致準備						■			
STEP 4	4. Candidacy for Host Country 敷地誘致意思表示							●		
	4.1 Selection process ILCによる敷地選定						■			
STEP 5	5. Selection as Host Country 誘致決定							●		
STEP 6	6. Commencement of Investigation/Design/Engineering 本格調査・設計着手							●		
	6.1 Site survey, soil investigation 敷地調査・地盤調査							■		
	6.2 Environmental impact analysis 環境影響調査							■		
	6.3 Agreement on contract method 事業実施方法の決定(入札手法・契約形態等)							■		
	6.4 Engineering (site preparation, underground facilities) 設計(土工事・地下工事)							■		
	6.5 Engineering (schematic design of surface buildings, services) 設計(建家・設備)							■		
	6.6 Design review and award of approval by regional authorities(設計審査・許認可)							■		
	6.7 Approval of funding agency 所轄官庁承認							■		
	6.8 Bid documents (invitation, instructions, condition of contract) 入札関連書類作							■		
	6.9 Approval of ILC Board ILC理事会承認							■		
STEP 7	7. Bid Call for the Initial Contract Package 入札開始									●
	7.1 Bidding and contracting procedure 入札手続き・契約手続き									■

Sep. 2007, Asian Region Kickoff

Conclusion

- ***CFS RDR was made in collaboration with three regional CFS teams, based on the criteria derived from each Area systems.***
- ***Site specific issues will be developed further in EDR phase.***
- ***Narrowing domestic potential sites is next important step.***
- ***Government approval is needed for site narrowing and obtaining enough budget for EDR phase.***
- ***The government approval will be obtainable in conjunction with the present projects and the future plan of KEK.***
- ***A realistic EDR time-line should be further discussed in order to form a reasonable EDR plan for all regions who intend to attend and contribute ILC project.***