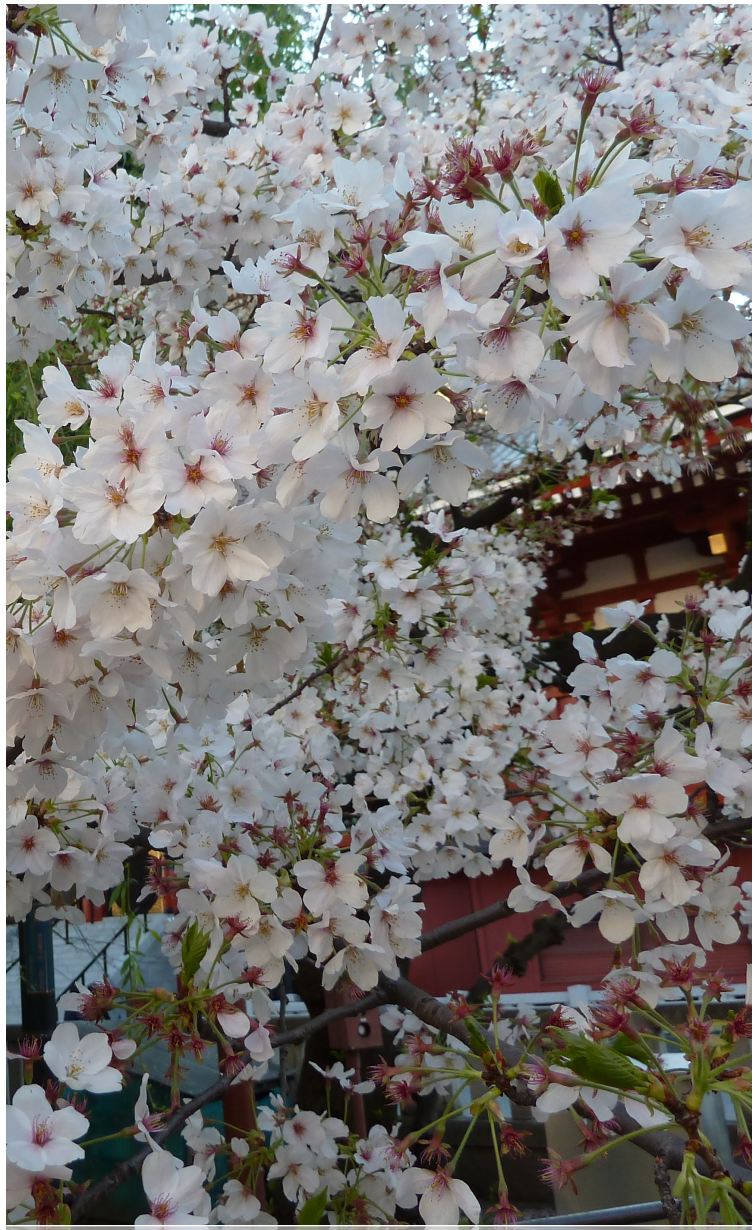


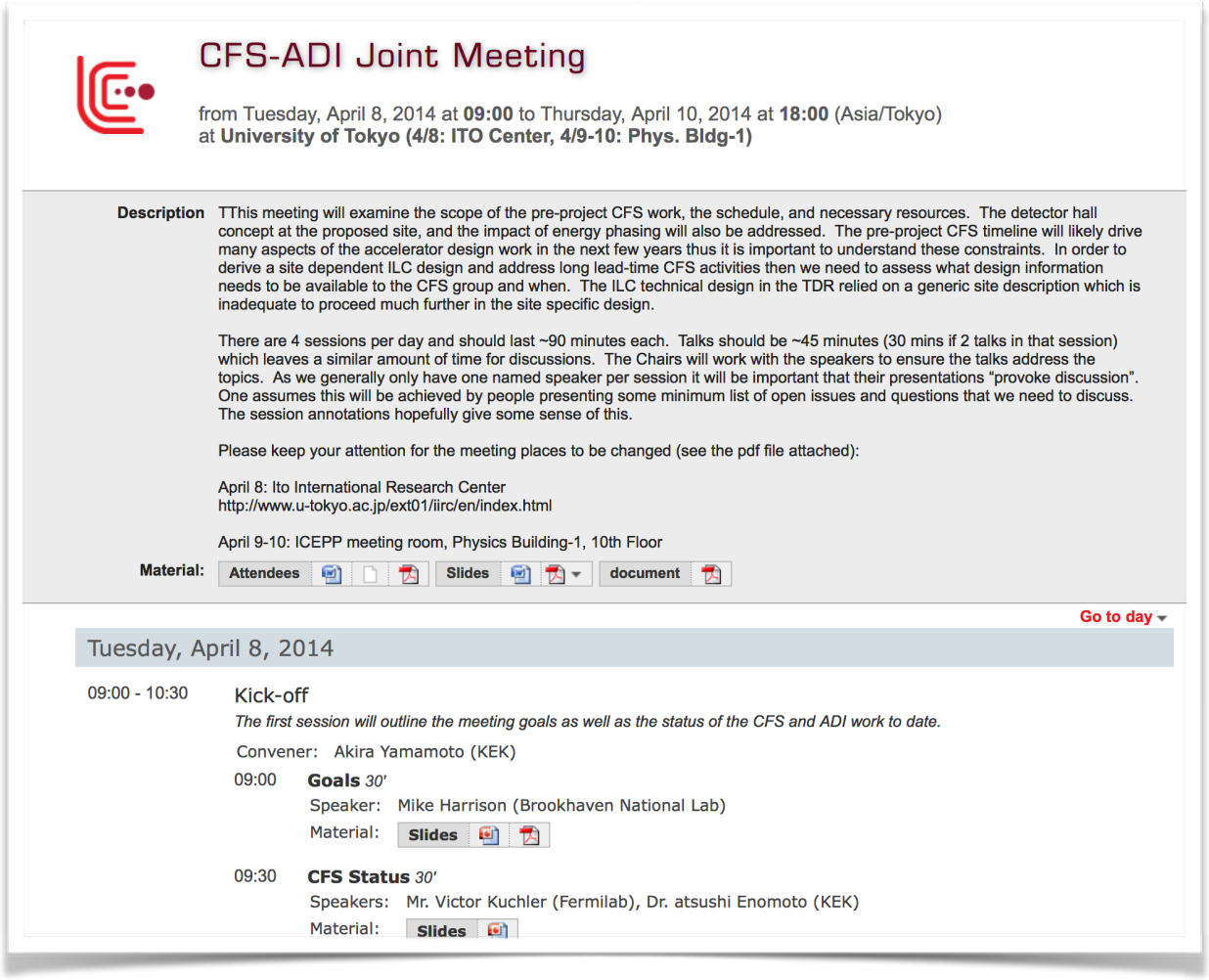
Impressions from ADI/CFS meeting - Tokyo 8-10.04.14

Nick Walker

109th ILC@DESY Project Meeting

25.04.14

CFS-ADI Joint Meeting



CFS-ADI Joint Meeting

from Tuesday, April 8, 2014 at **09:00** to Thursday, April 10, 2014 at **18:00** (Asia/Tokyo)
at **University of Tokyo (4/8: ITO Center, 4/9-10: Phys. Bldg-1)**

Description TThis meeting will examine the scope of the pre-project CFS work, the schedule, and necessary resources. The detector hall concept at the proposed site, and the impact of energy phasing will also be addressed. The pre-project CFS timeline will likely drive many aspects of the accelerator design work in the next few years thus it is important to understand these constraints. In order to derive a site dependent ILC design and address long lead-time CFS activities then we need to assess what design information needs to be available to the CFS group and when. The ILC technical design in the TDR relied on a generic site description which is inadequate to proceed much further in the site specific design.

There are 4 sessions per day and should last ~90 minutes each. Talks should be ~45 minutes (30 mins if 2 talks in that session) which leaves a similar amount of time for discussions. The Chairs will work with the speakers to ensure the talks address the topics. As we generally only have one named speaker per session it will be important that their presentations "provoke discussion". One assumes this will be achieved by people presenting some minimum list of open issues and questions that we need to discuss. The session annotations hopefully give some sense of this.

Please keep your attention for the meeting places to be changed (see the pdf file attached):

April 8: Ito International Research Center
http://www.u-tokyo.ac.jp/ext01/iirc/en/index.html

April 9-10: ICEPP meeting room, Physics Building-1, 10th Floor

Material: Attendees | Slides | document

Go to day

Tuesday, April 8, 2014

09:00 - 10:30 Kick-off

The first session will outline the meeting goals as well as the status of the CFS and ADI work to date.

Convener: Akira Yamamoto (KEK)

09:00 **Goals** *30'*
Speaker: Mike Harrison (Brookhaven National Lab)
Material: Slides

09:30 **CFS Status** *30'*
Speakers: Mr. Victor Kuchler (Fermilab), Dr. atsushi Enomoto (KEK)
Material: Slides

2.5 days

Focus: pre-construction work for Kitikama site development

- 3-5 year plan

Identify priority accelerator design issues

- Needed by CFS team

https://agenda.linearcollider.org/conferenceDisplay.py?confId=6342

Who attended?

International

- Karsten Büßer (DESY) - MDI
- Lyn Evans (CERN) - LCC
- Brian Foster (DESY, UH) - LCC
- Mike Harrison (BNL) - LCC
- Vic Kuchler (FNAL) - CFS
- Benno List (DESY) - ADI
- John Osborne (CERN) - CFS
- Ewan Paterson (SLAC) - ADI
- Marc Ross (SLAC) - ILC TB
- Nikolay Solyak (FNAL) - ILC TB
- Nick Walker (DESY) - ILC TB
- Harry Weerts (ANL) - LCC

Japan

- Atsushi Enomoto (KEK) - CFS
- Masanobu Miyahara (KEK) - CFS
- Tomoyuki Sanuki (U. Tohoko) - CFS
- Nobuhiro Terunuma (KEK) - ILC-TB
- Akira Yamamoto (KEK) - ILC-TB
- Hitoshi Yamamoto (KEK) - ILC-TB
- Yasuchika Yamamoto (KEK) - ILC-TB
- Kaoru Yokoya - (KEK) - ADI
- Masao Kuriki (U. Hiroshima) -ADI
- Tsunihiko Omori (KEK) - ADI

Japan (observers)

- Yoshinobu Nishimoto (JPower)
- Go Urukawa (JPower)

Session themes

- Session 1 Introductions and goals
- Session 2 CFS pre-project activities
  - pre-project work scope, Japanese plans and required funding
- Session 3 ADI support for CFS work
  - TDR design 'loose ends', outstanding critical decisions that affect CFS site development
- Session 4 Technology support for CFS
  - Radiation shielding for tunnel and helium inventory and safety aspects
- Session 5 MDI I
  - Detector CFS requirements (detector hall)
- Session 6 MDI II
  - Detector hall solutions and IR location
- Session 7 Energy phasing
  - 1st phase 250 GeV machine and its implications
- Session 8 Site infrastructure
  - Power usage, and possible ways to reduce it
- Session 9 CFS near-term questions for ADI
  - What are the critical questions that need to be answered now?
- Session 10 Wrap up

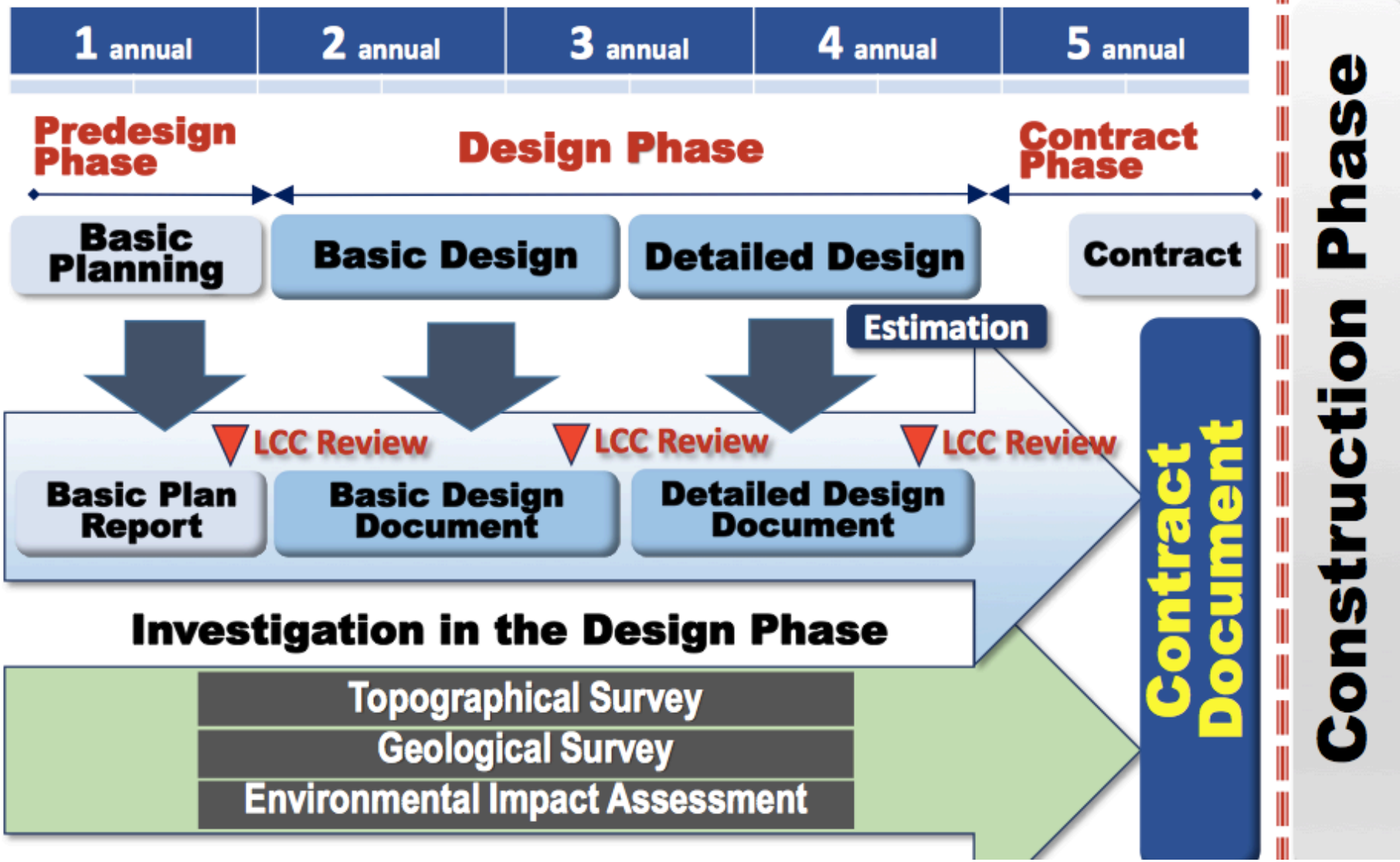
Overal impression

- Well organised meeting
- Good exchange of information
  - between Japanese CFS and accelerator
- Provided some focus for next steps
  - in particular planning for AWLC 14
- Highlighted the enormity of the work that really needs to be done
  - and the lack of resources to do it!
- Our Japanese hosts were very gracious (as always)

CFS Site-Specific

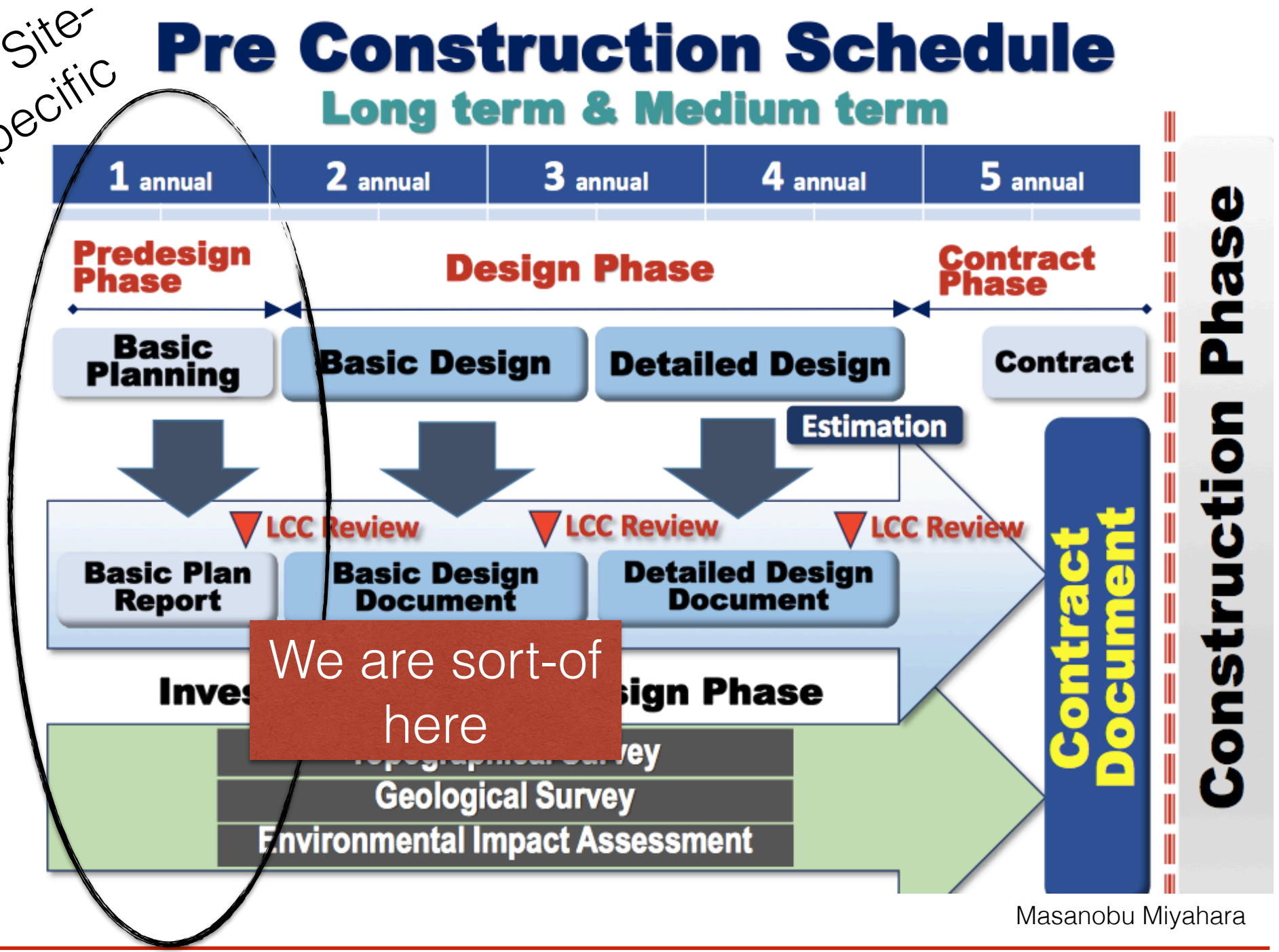
Pre Construction Schedule

Long term & Medium term



Masanobu Miyahara

CFS Site-Specific

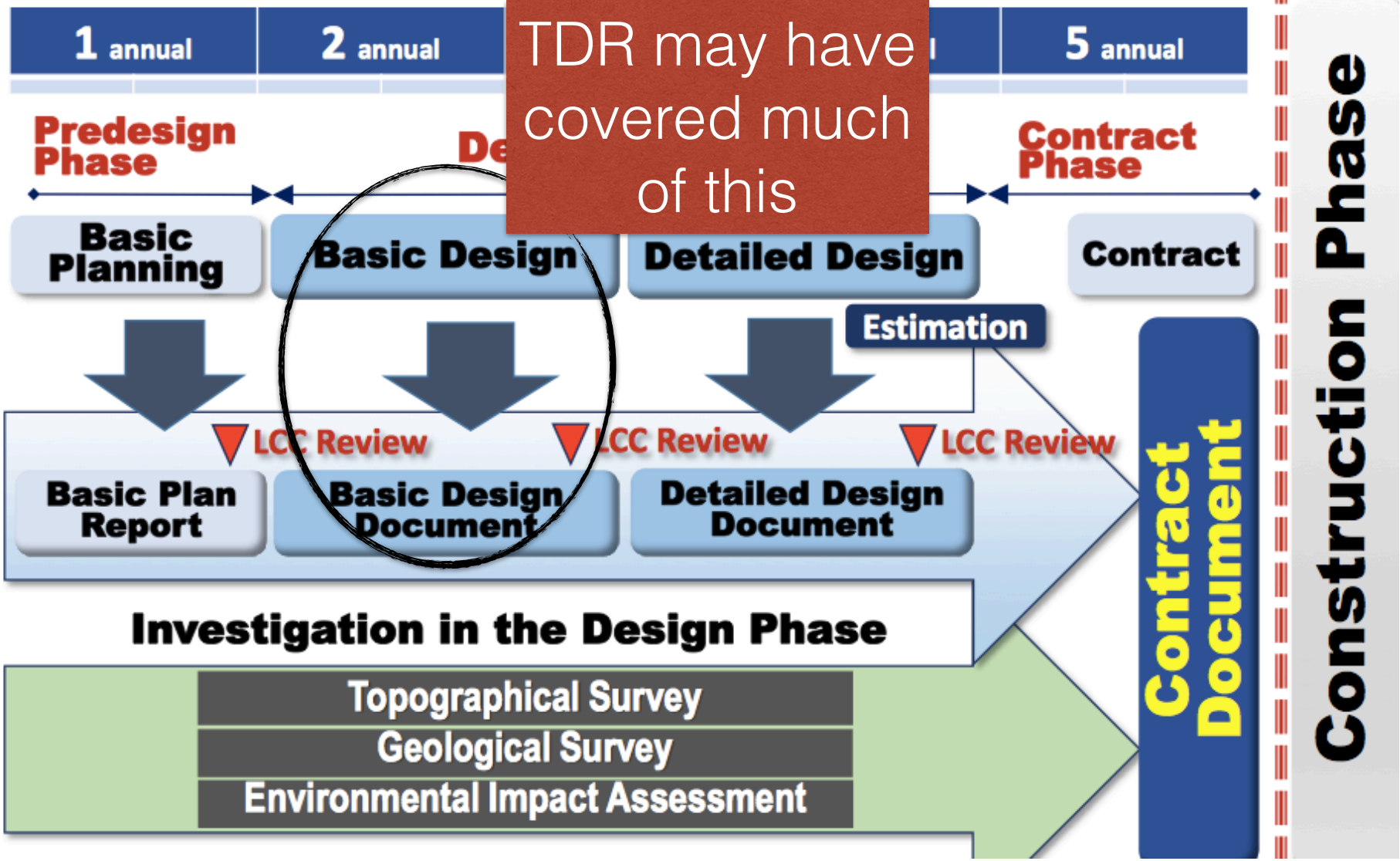


Masanobu Miyahara

CFS Site-Specific

Pre Construction Schedule

Long term & Medium term



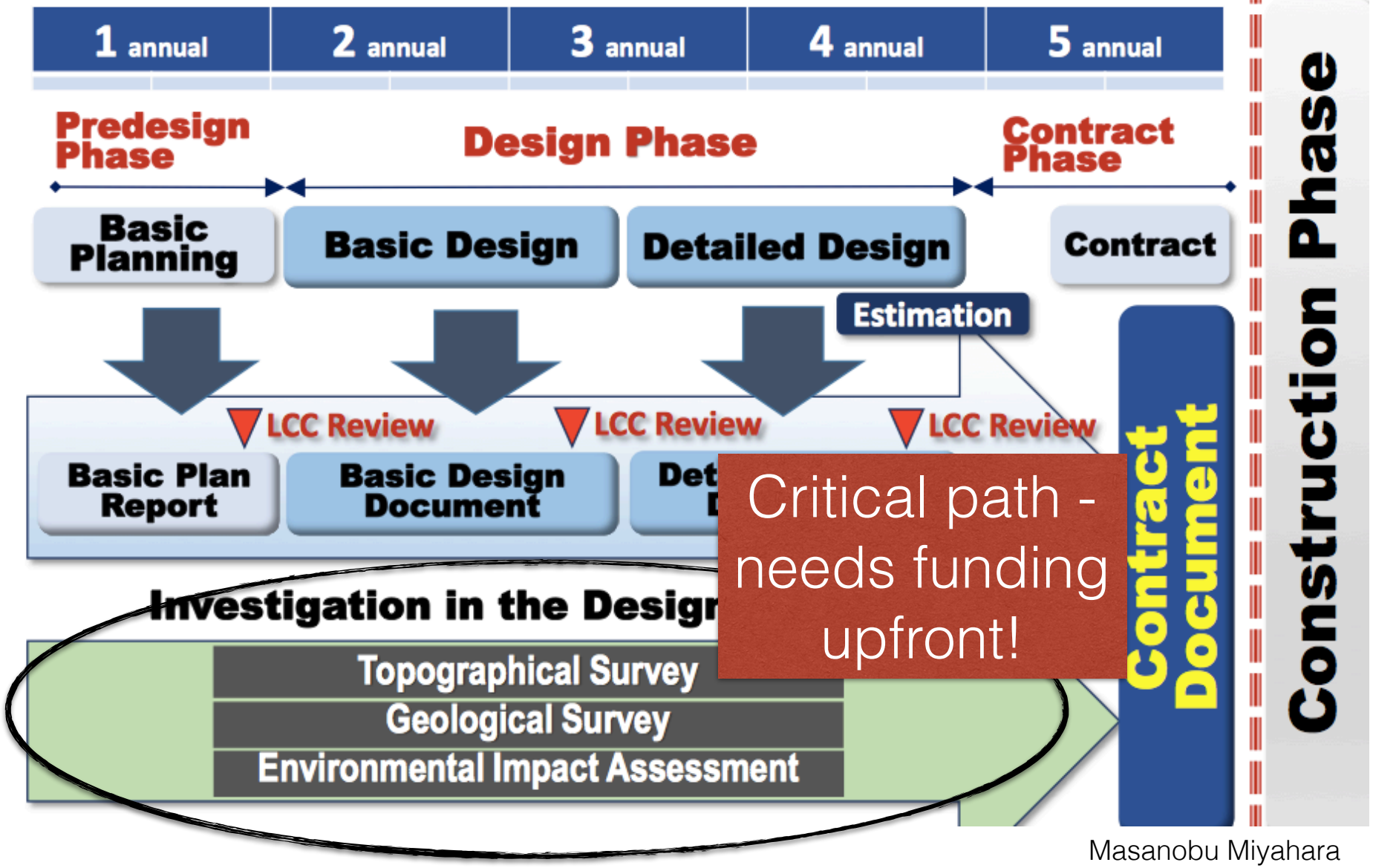
TDR may have covered much of this

Masanobu Miyahara

CFS Site-Specific

Pre Construction Schedule

Long term & Medium term



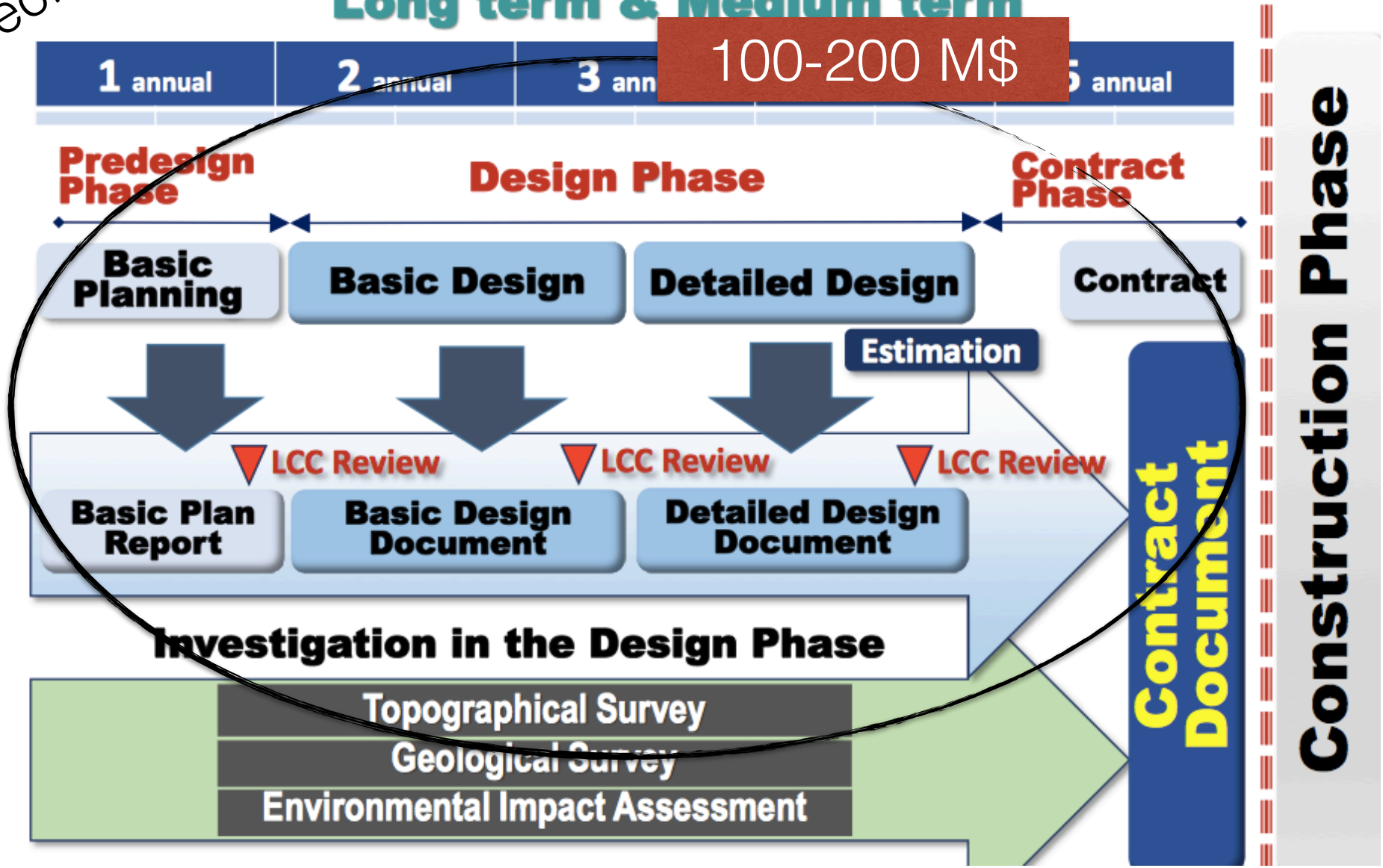
Critical path - needs funding upfront!

Masanobu Miyahara

CFS Site-Specific

Pre Construction Schedule

Long term & Medium term

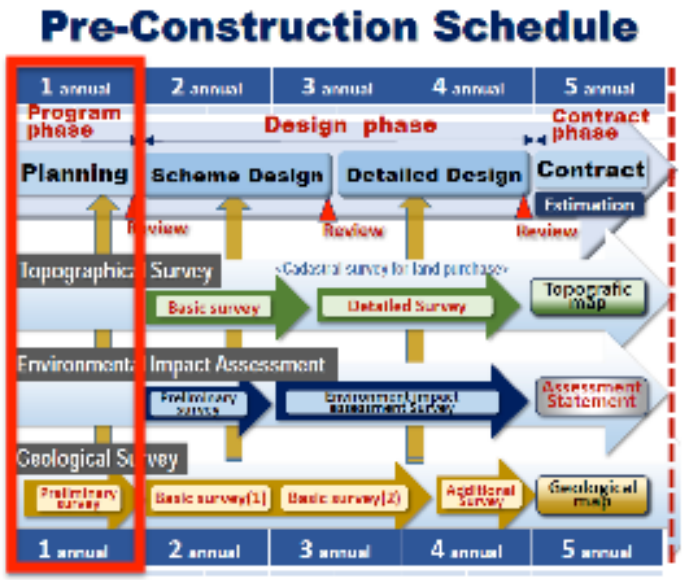


Masanobu Miyahara

A question of money

Near-term Schedule

- *What can we prepare with limited budget before green sign (project approval)?*
- *What should be determined and included in the Planning Document?*



How far can we go along this schedule with our (very) limited resources?

Vic Kuchler

Pre Construction Design Work

Civil Engineering Design

WORK SCOPE TABLE by every phase			
	Basic Planning	**Basic Design**	**Detailed Design**
Facility Arrangement	**R**	**OR**	**NR**
	Determination of - IR point, Access system - BL Route & Elevation	Revision of - IR point, Access system - Site & Access portal	- Minor modifications of the basic design
Shape & Dimension	**R**	**OR**	**NR**
	Determination of - Cross Section Shape - Basic Dimension	Revision of - Cross section Shape - Whole Dimension	- Minor modifications of the basic design
Structure & Materials	-	**OR**	
		Structural plannir - Load condition, - Seismic Design p	
Schedule & Cost	**R**	**NR**	
	- Assumption Schedule - Outline Cost Estimation	Trial Estimation - Direct Cost, Unit	

End of 2014:

IR location ±100m
Machine end points ±300m

Legend: **R**=Required **OR**=Optional Required **NR**=Not Required

Masanobu Miyahara

CFS Driven AD&I (summary)

- Priority 1: Length of Tunnel
- Priority 2: Underground Volume
- Priority 3: Conventional Facilities (mech & electrical)
  - We should try and review as best as possible the status of the above
  - CFS should "lead the way"
    - what? when? how accurate?

From discussions:

- vibration tolerances (ground motion) ☚ tunnel ~20m deep!
- survey & alignment requirements

LCC-Phase resource summary for Accelerator Design

Row Labels	BDS min	BDS max	Damping Rings min	Damping Rings max	Electron Source min	Electron Source max	Main Linacs min	Main Linacs max	Positron Source min	Positron Source max	RTML min	RTML max	Total min	Total max
Accelerator physics	0	0	3	9					3	9			6	18
Beam dynamics	9	18	4	6			3	6	6	12	3	6	25	48
Cryomodule							1	3					1	3
Integration	1	3			2	2	1	3	4	8			8	16
Lattice designer	2	6	1	2	1	3	3	6	4	9	1	3	12	29
Magnet/PS	1	3	1	3	1	3	1	3	3	7	1	3	8	22
Management									0	0			0	0
SRF			1	1			1	3					2	4
Vacuum	1	3	1	3	1	1	1	3	2	4	1	3	7	17
Warm RF					1	3			4	8			5	11
Grand Total	**14**	**33**	**11**	**24**	**6**	**12**	**11**	**27**	**26**	**57**	**6**	**15**	**74**	**168**

estimated ~10 person years (±4)

Scope (reminder)

- Bring TDR up to consistent level of detail (but still conceptual —
- Re-evaluate and fix critical CFS requirements
- Incorporate energy-phasing design aspects

Pre Construction Design Work

Civil Engineering Design

WORK SCOPE TABLE by every phase			
	Basic Planning	**Basic Design**	**Detailed Design**
Facility Arrangement	**R**	**OR**	**NR**
	Determination of - IR point, Access system - BL Route & Elevatio	Revision of - IR point, Access system l	- Minor modifications of the basic design
Shape & Dimension	**R**	**OR**	**NR**
	Determination of - Cross Section Shape - Basic Dimension	Revision of - Cross section Shape - Whole Dimension	- Minor modifications of the basic design
Structure & Materials	**-**	**OR**	**NR**
		Structural planning - Load condition, Materials - Seismic Design plan	- Structural Design - Construction planning - Detailed Design
Schedule & Cost	**R**	**NR**	**NR**
	- Assumption Schedule - Outline Cost Estimation	Trial Estimation - Direct Cost, Unit cost	Cost Estimation - Final Cost for Bidding

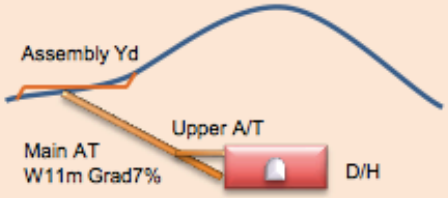
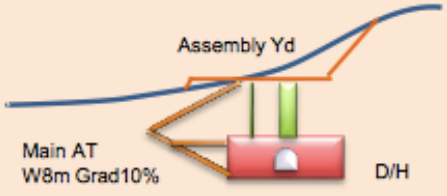
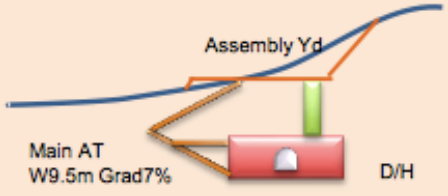
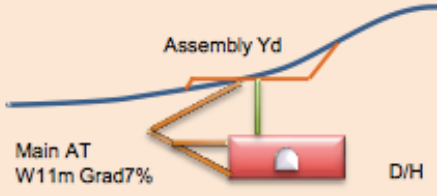
A focus of attention!

Legend: **R**=Required **OR**=Optional Required **NR**=Not Required

Detector Hall - Shafts versus Tunnels

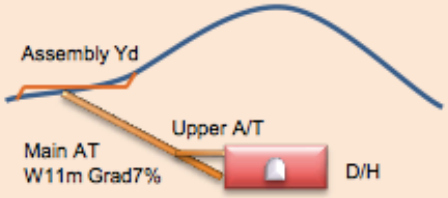
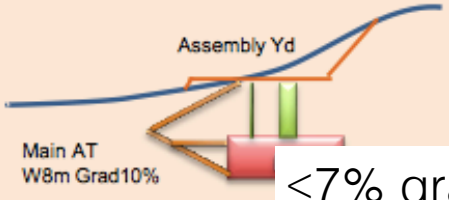
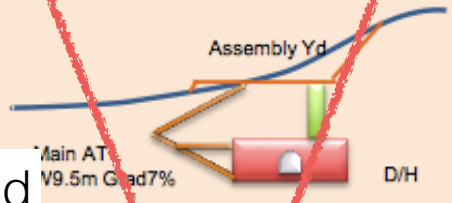
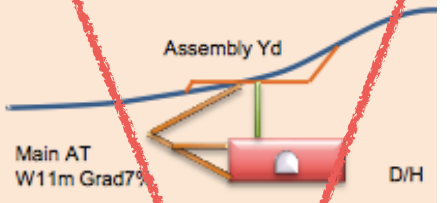
Shift IR location to facilitate vertical shaft - ILC request

Hybrid option case study

Baseline	Hybrid-A	Hybrid-B	Hybrid-C
			
• 1 HT (11x11m 7%grad) • Detector assembling is inside of DH	• 1 HT (8.0x7.5m 10%gradl) • 2 VS (D18m, D10m) • Detectors assembling is on-ground.	• 1 HT (9.5x9.0m 7%gradl) • 1 VS (D18m) • ILD assembling on-ground • SiD inside D/H	• 1 HT (11x11m 7%grad) • 1 VS (D10m) • Detector assembling is inside of DH
• UT lines in DR/AT	• UT lines in UT shaft	• UT lines in Main shaft	• UT lines in UT shaft
• DH 175,000m3 • L144m H42m W25m	• DH 128,000m3 • L108m H42m W25m	• DH 165,000m3 • L134m H42m W25m	• DH 175,000m3 • L144m H42m W25m
• Heavy lowering system non	• Heavy lowering system necessary	• Heavy lowering system necessary	• Heavy lowering system non
• Location of DH and assembly yd. can be selected individually.	• Assembly hall is above D/H	• same as on the left	• same as on the left
• Human pass way :car • Machine and materials tunnel by vehicles	• Human pass way :elevator • Machine and materials tunnel by vehicles	• Human pass way :elevator • Machine and materials ILD:VS HT , SiD:HT	• Human pass way :elevator • Machine and materials tunnel by vehicles
• Environmental impact will be smaller during construction.	• Noise reduction	• same as on the left	• same as on the left

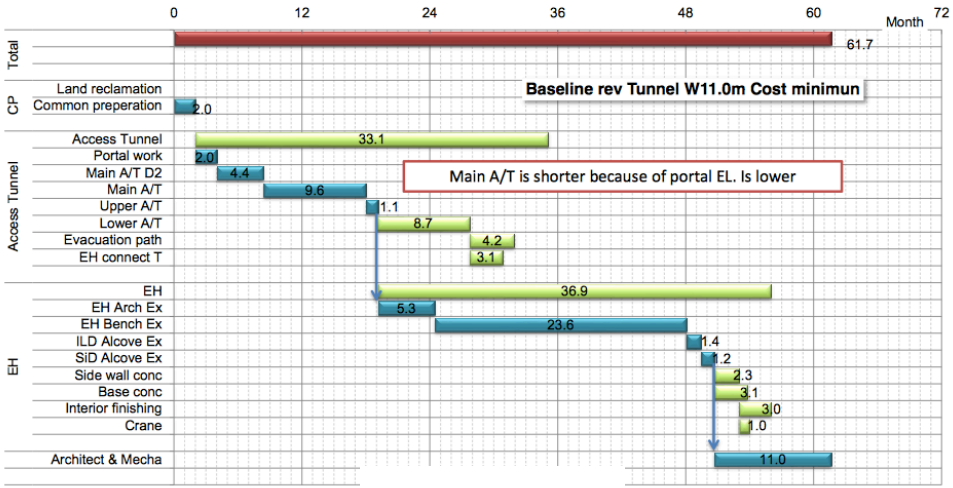
Detector Hall - Shafts versus Tunnels

Hybrid option case study

Baseline	Hybrid-A	Hybrid-B	Hybrid-C
	 ≤7% grad		
• 1 HT (11x11m 7%grad) • Detector assembling is inside of DH	• 1 HT (8.0x7.5m ~~10%grad~~) • 2 VS (D18m, D10m) • Detectors assembling is on-ground.	• 1 HT (9.5x9.0m 7%gradl) • 1 VS (D18m) • ILD assembling on-ground • SiD inside D/H	• 1 HT (11x11m 7%grad) • 1 VS (D10m) • Detector assembling is inside of DH
• UT lines in DR/AT	• UT lines in UT shaft	• UT lines in Main shaft	• UT lines in UT shaft
• DH 175,000m3 • L144m H42m W25m	• DH 128,000m3 • L108m H42m W25m	• DH 165,000m3 • L134m H42m W25m	• DH 175,000m3 • L144m H42m W25m
• Heavy lowering system non	• Heavy lowering system necessary	• Heavy lowering system necessary	• Heavy lowering system non
• Location of DH and assembly yd. can be selected individually.	• Assembly hall is above D/H	• same as on the left	• same as on the left
• Human pass way :car • Machine and materials tunnel by vehicles	• Human pass way :elevator • Machine and materials tunnel by vehicles	• Human pass way :elevator • Machine and materials ILD:VS HT , SiD:HT	• Human pass way :elevator • Machine and materials tunnel by vehicles
• Environmental impact will be smaller during construction.	• Noise reduction	• same as on the left	• same as on the left

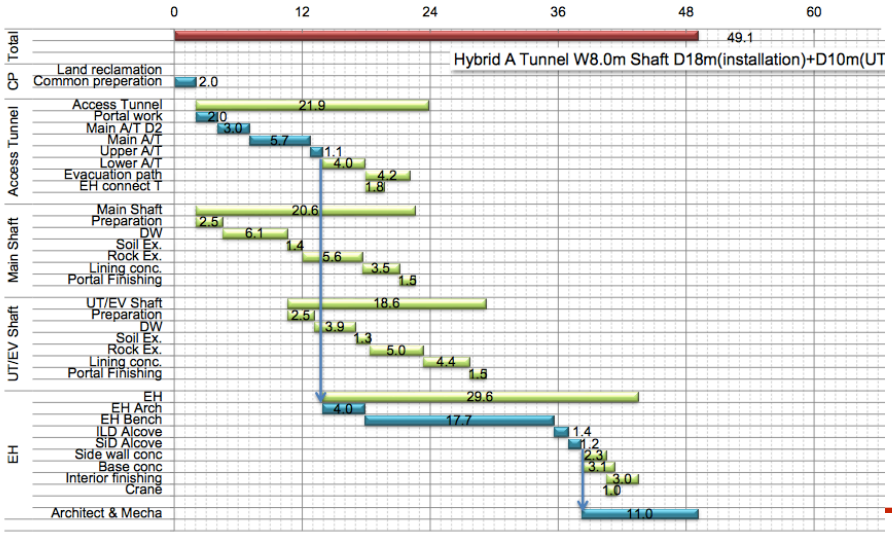
Detector hall construction

Baseline (Detectors / HT installation) Schedule



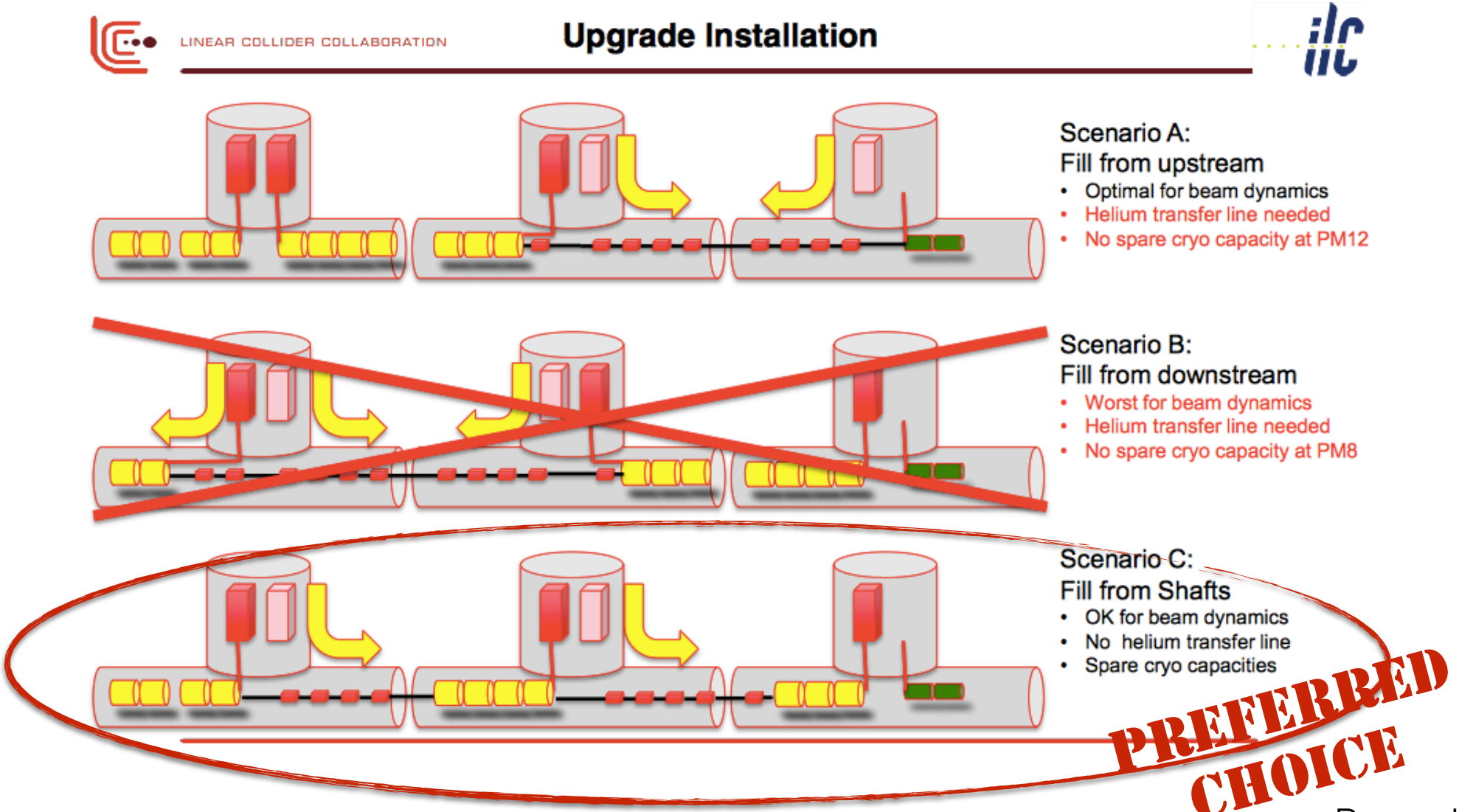
5 years

Hybrid-A (Detectors / VS installation) Schedule



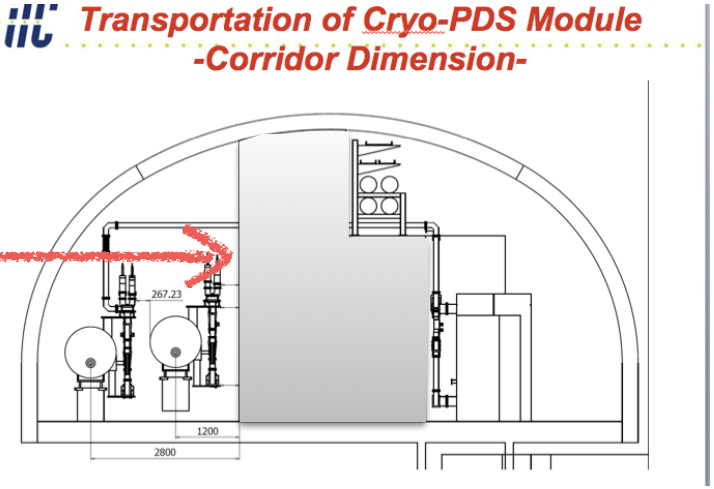
- Hybrid A saves ~1 year
- Does not include detector platform & infrastructure
  - additional 2 years?
- ILD surface assembly
  - à la CMS
- SiD preference for in-cavern assembly
  - near-horizontal access
- Beam commissioning?
  - Machine instrumentation @ IP?
  - Shielding?

Energy Phasing: Approach to 1st phase

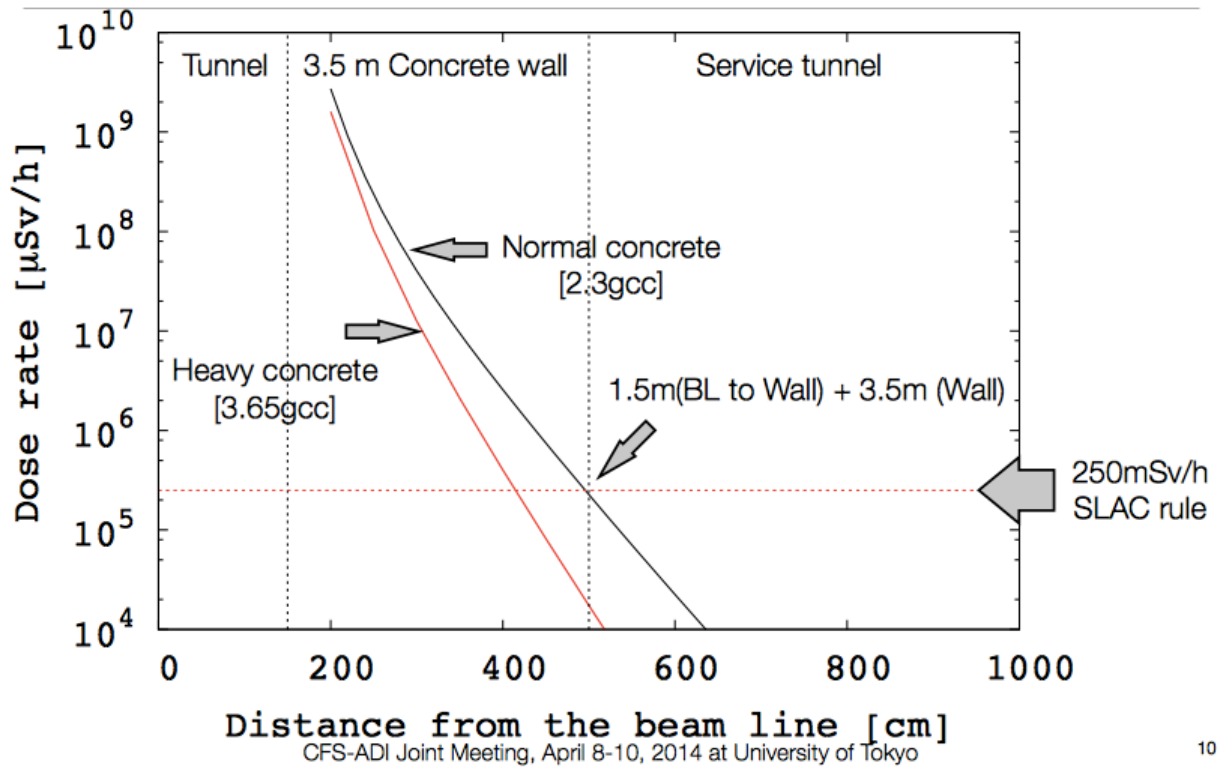


Radiation safety

- How thick does this wall have to be?



- Also important for detector shielding
- Current approach "conservative"
  - British understatement



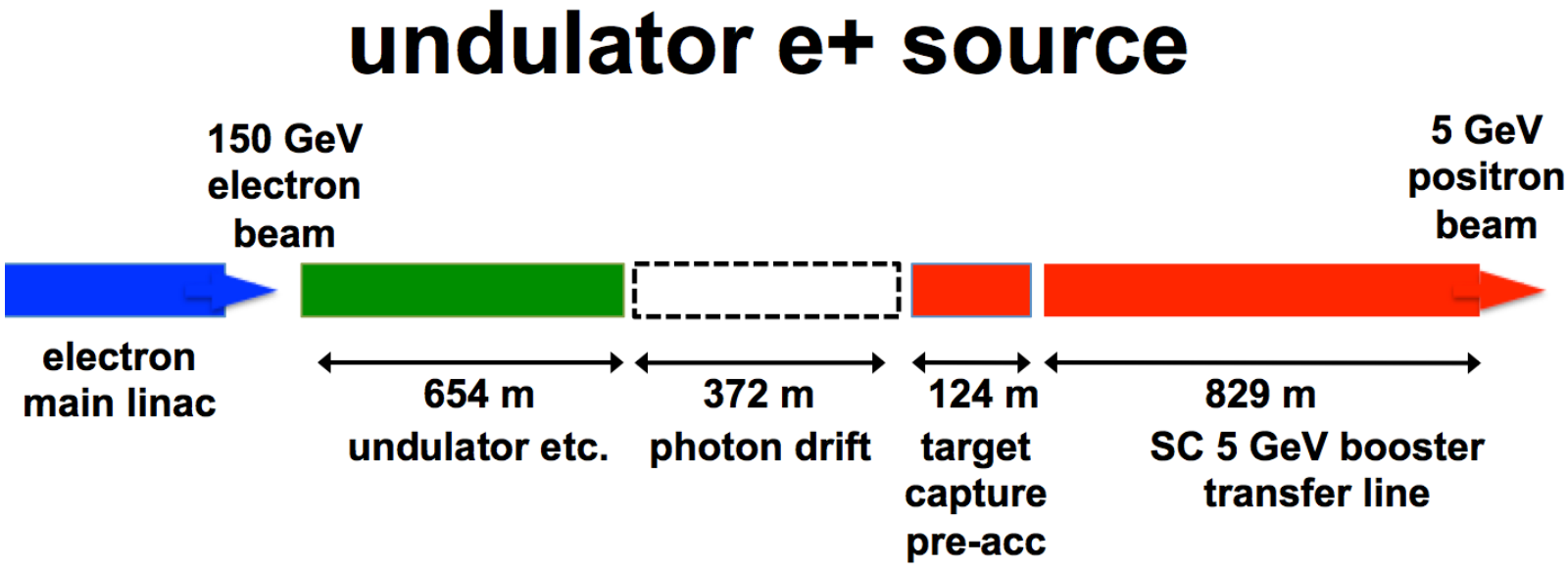
e+ source proposal (T. Omori)

Discussion@LCWS2013(Tokyo)

If we start with "Conventional", we need to keep smooth path to "Undulator".

footprint compatibility (no change of the tunnel)

- "300Hz conventional source" should fit the space for "undulator source"



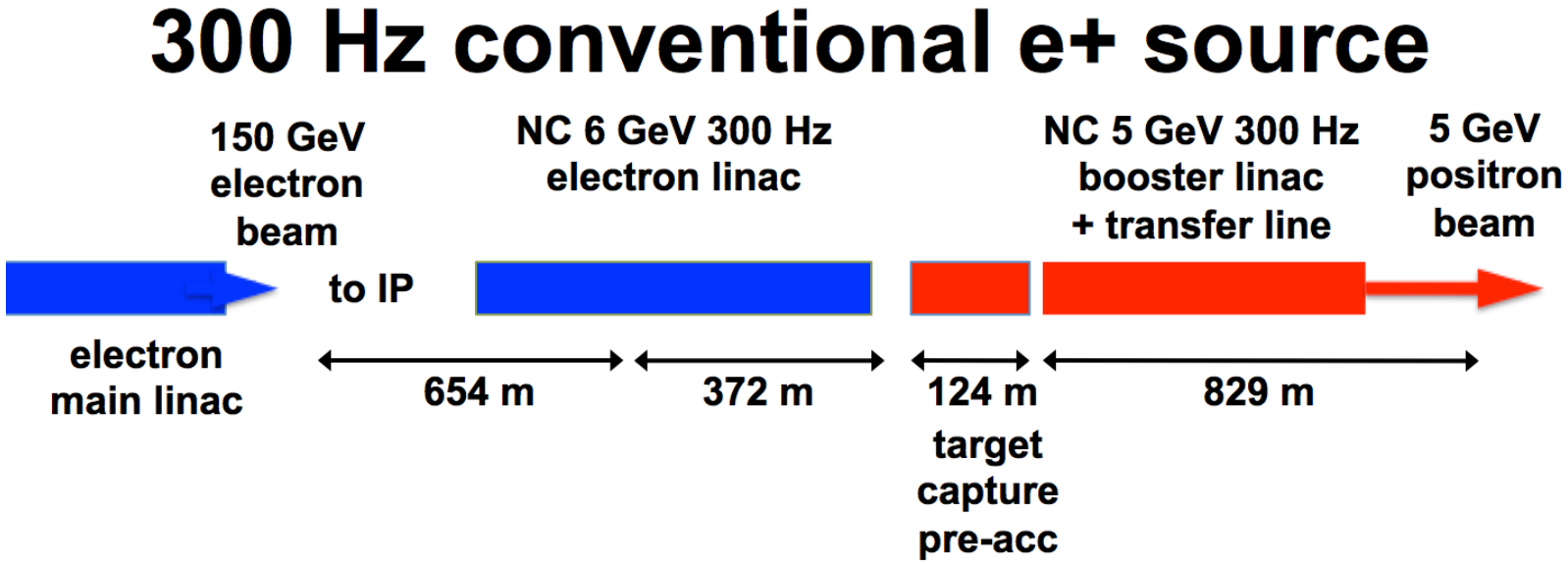
e+ source proposal (T. Omori)

Discussion@LCWS2013(Tokyo)

If we start with "Conventional", we need to keep smooth path to "Undulator".

footprint compatibility (no change of the tunnel)

- "300Hz conventional source" should fit the space for "undulator source"



Role of Central ILC Lab

- How do the lab/campus facilities interact with the project – equipment testing, engineering support, equipment staging and storage, offices, power & water infrastructure, etc…

  - Other than some generic arm waving estimates we have little meaningful information here.

  - We need to decide on the perceived role of the ILC laboratory and start with some form of functional analysis.

  - Principally, but not completely, a [Japanese] domestic issue

Role of Central ILC Lab

- How do the lab/campus facilities interact with the project – equipment testing, engineering support, equipment staging and storage, offices, power & water infrastructure, etc…

on-site needs of the Detector and Machine

  - Other than some generic arm waving estimates we have little meaningful information here.

  - We need to decide on the perceived role of the ILC laboratory and start with some form of functional analysis.

  - Principally, but not completely, a [Japanese] domestic issue

LCC can help with the requirements - but Japan needs to decide how to implement.

Forwards…

- **Keep calm and carry on (to AWLC 14 @ Fermilab)**
  - IR location and detector hall layout
  - (Limited) accelerator design work
    - priority: fix tunnel length!
  - Some efforts on rad. and LHe safety requirements
- **Planning for more money!**
  - Convert CFS PowerPoint schedule a real plan
    - resource loaded
    - cost/resource estimate
    - basis of bid to Japanese MEXT for real (pre-construction) money