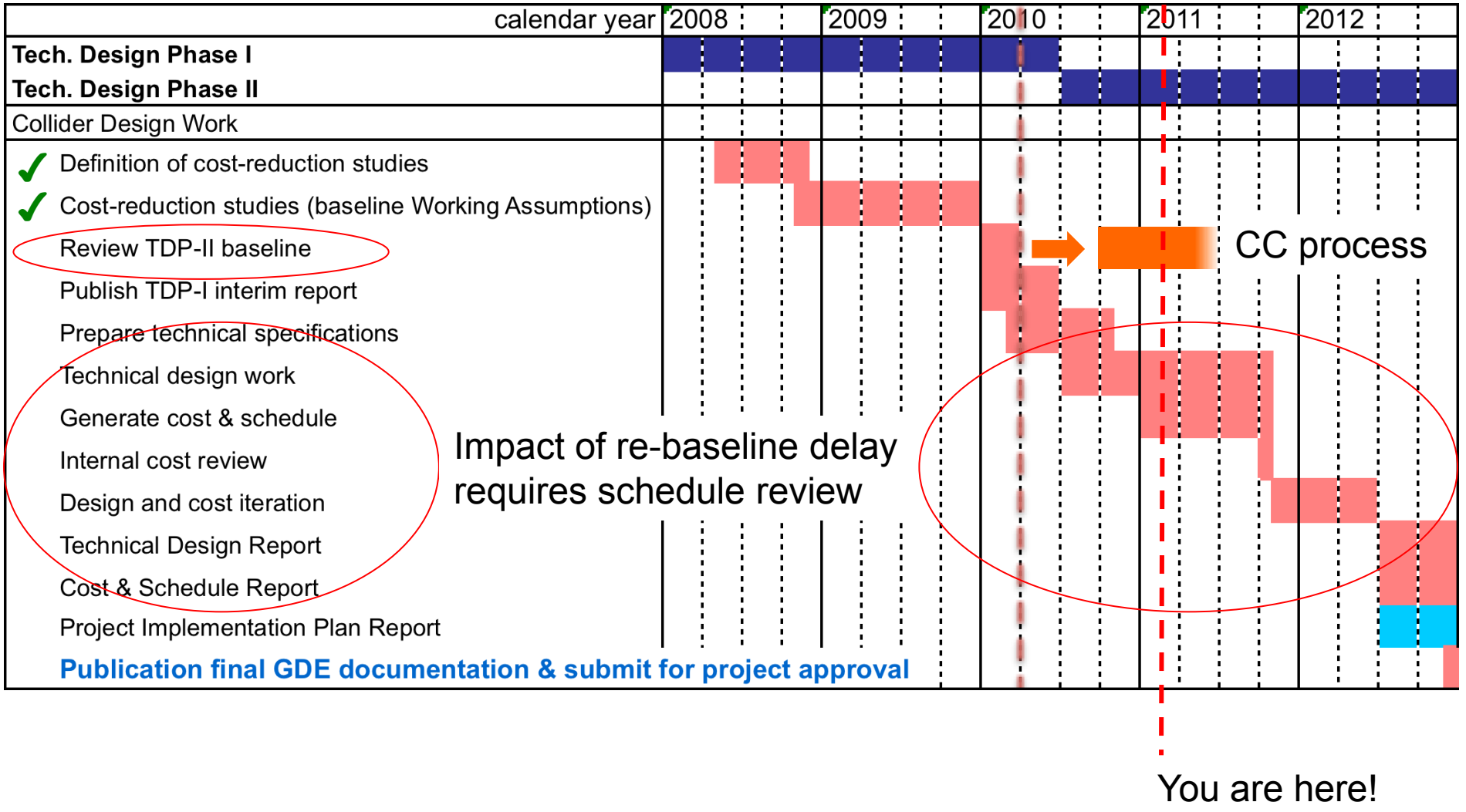
Planning for TDP-2 (towards the TDR)

Nick Walker for the PM

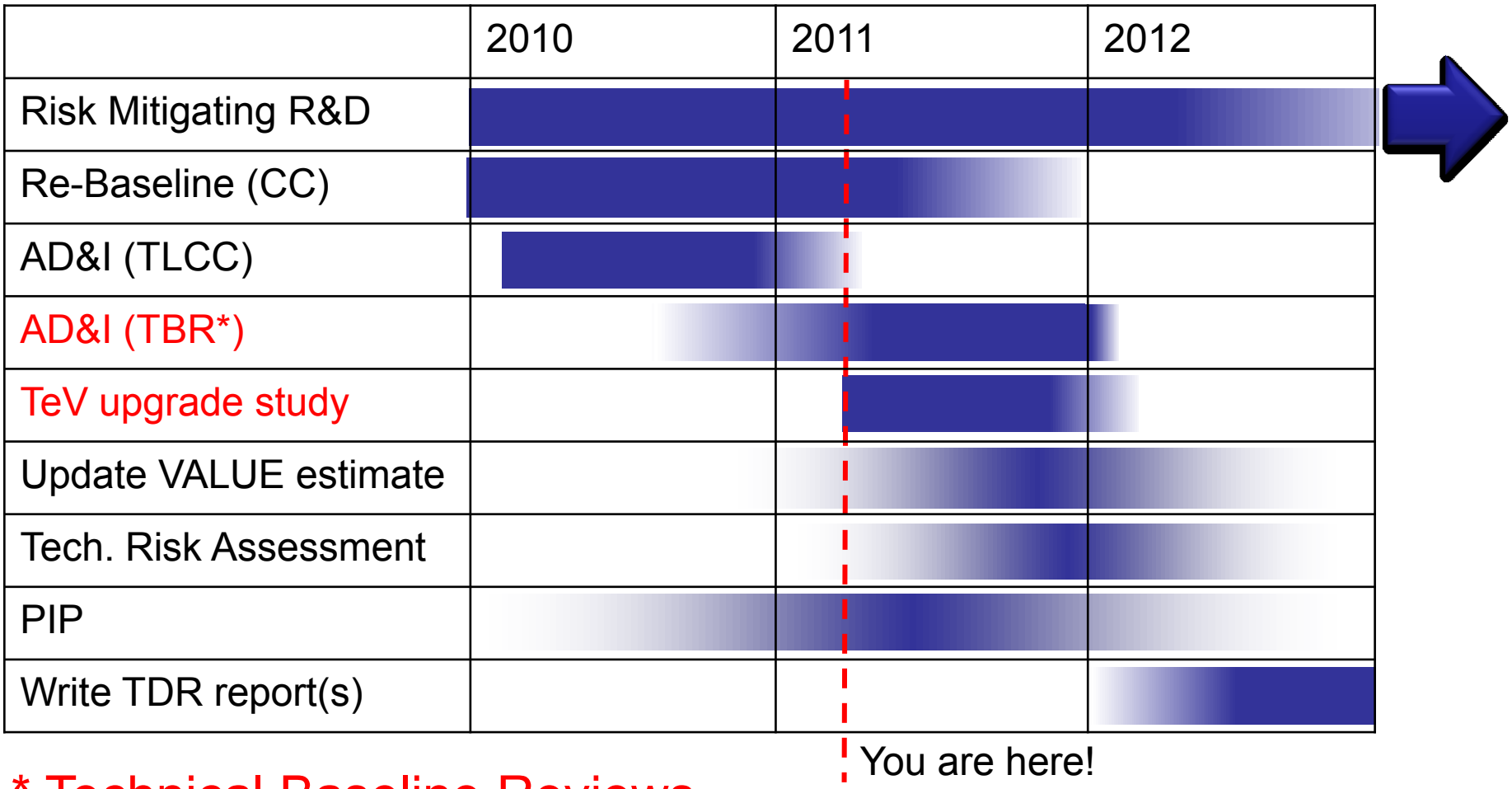
TD Phase Goals – A Reminder

- **TDR deliverables:**
  - Results from Risk Mitigating R&D
  - Updated Reference Design
  - Updated VALUE estimate
  - Project Implementation Plan
- **General Goals**
  - Risk Mitigating R&D
    - Main Linac SCRF [gradient, cavity yield, mass-production and industrialisation]
    - Beam Test Facilities [ATF/ATF2, CESRTA, TTF/FLASH, DAPHNE…]
    - Sources…
  - Accelerator Design & Integration
    - Integrated, robust and simplified design
    - Cost containment

Collider Design Work (ADI)



Planning for the TDP 2



* Technical Baseline Reviews

TDP Key Focus (beyond R&D)

SCRF Cost	CFS design & cost	Baseline Design
• mass production models • global distribution	• Design update • Value engineering	• Final design decisions • Documentation • Cost estimate

Highest Priority (new estimate)

High Priority (updated estimate)

RDR update Documentation (scaled estimate)

CFS requirements critical input

Importance of Documentation

- **Comprehensive set of documents is the GDE's primary legacy**
  - in addition to global infrastructure and knowledge
- **We are obliged to produce as complete set of design documentation as possible**
  - build on the success of the RDR
  - go beyond the RDR
- **Solid basis for updated cost estimate**
  - Keyword: traceability

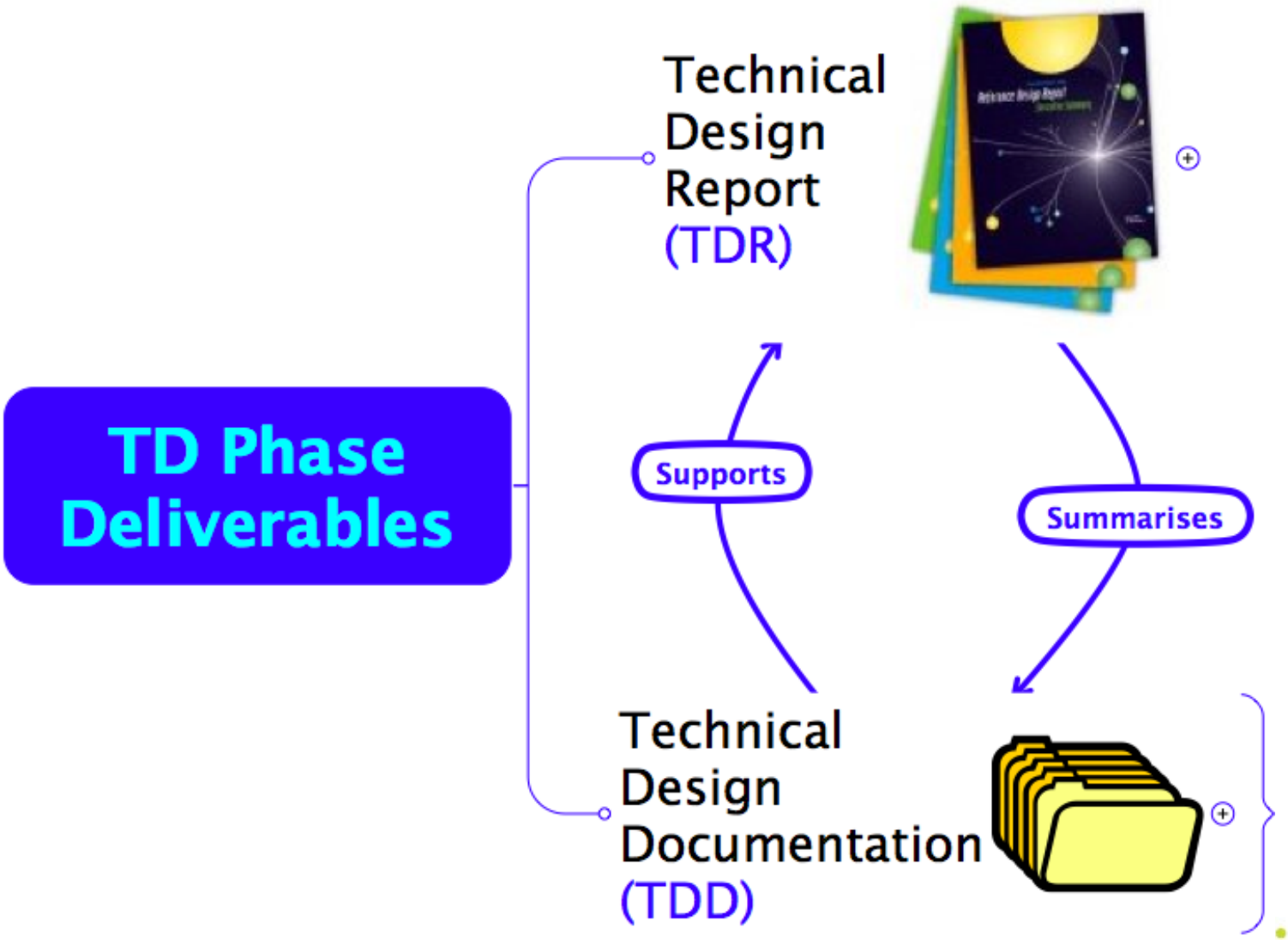
TDP Documentation

TD Phase Deliverables

- Technical Design Report (TDR)
  - 
  - Documents primary TDR deliverables
    1. Results and status of Risk Mitigating R&D
    2. Updated Reference Design
    3. Updated VALUE estimate
    4. Project Implementation Plan
    5. Technical risk assessment and future R&D
  - Readable
  - 6–9 months to write
- Supports
- Summarises
- Technical Design Documentation (TDD)
  - 
  - Reference Documentation
  - Structured and linked
  - Basic design documentation
    - Parameter tables
    - Requirements
    - Specifications
    - Design documents
    - Drawings (2D)
    - CAD-3D models
    - ...
  - Cost information
  - Schedule
  - ICET

ILC-EDMS

Two Important Concepts



Two Important Concepts

Traditional Understood (RDR-like) (Hard work)

TD Phase Deliverables

Technical Design Report (TDR)

Supports

Summarises

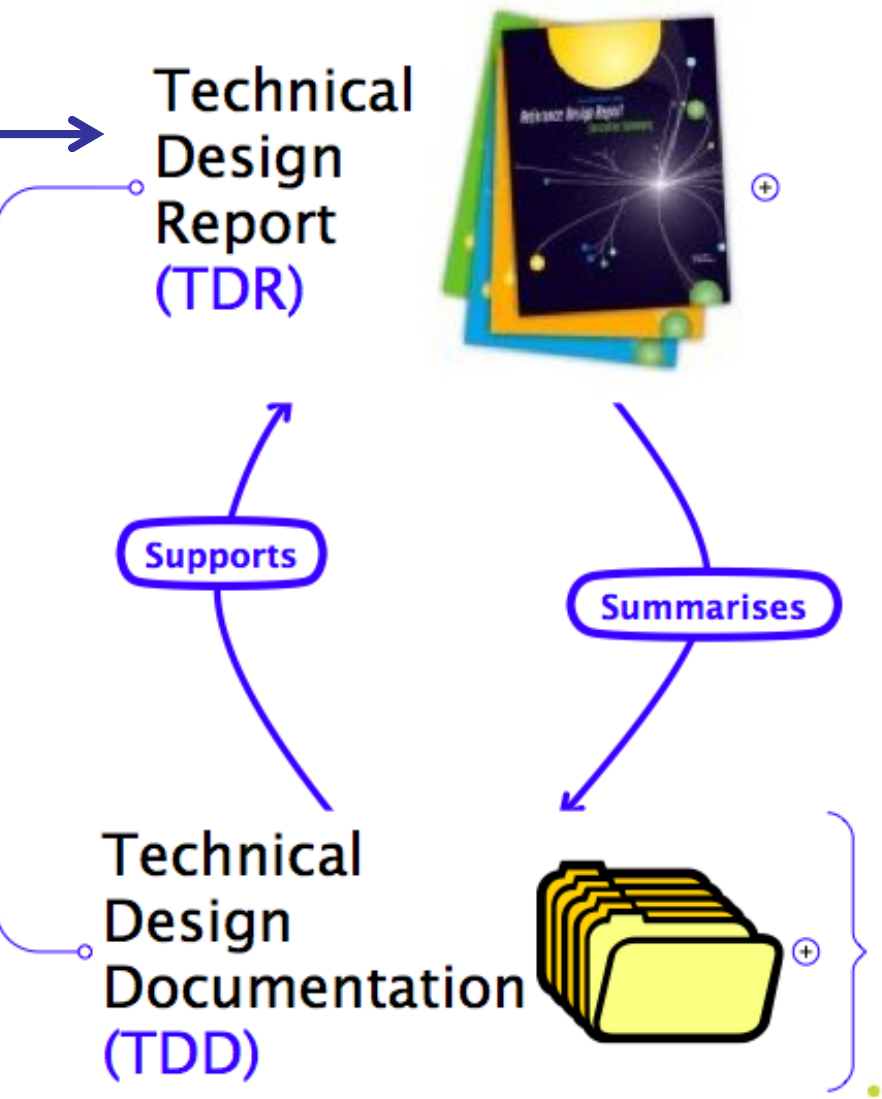
Technical Design Documentation (TDD)

Two Important Concepts

Traditional
Understood
(RDR-like)
(Hard work)

TD Phase Deliverables

Integrated with design process
Used to capture "design decisions"
Much more detail
(continuous effort)



Technical Design Report

Technical Design Report (TDR)

Documents primary TDR deliverables

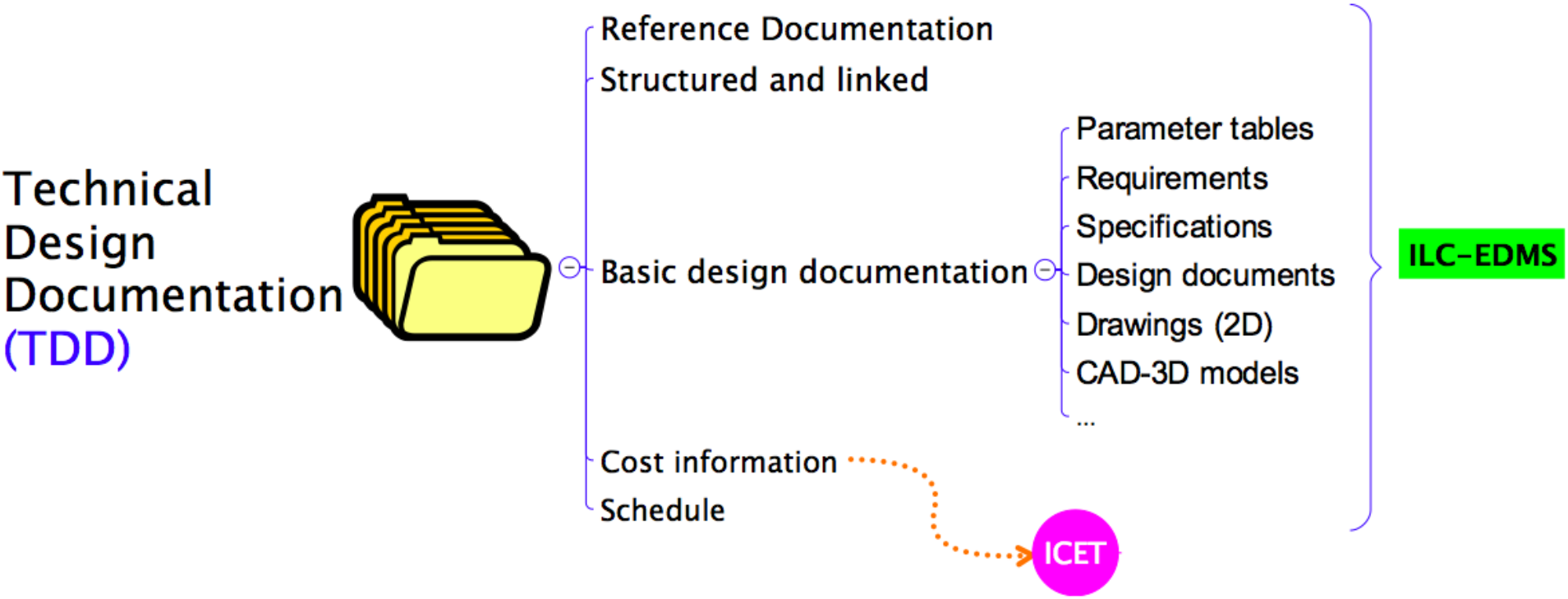
1. Results and status of Risk Mitigating R&D
2. Updated Reference Design
3. Updated VALUE estimate
4. Project Implementation Plan
5. Technical risk assessment and future R&D

Readable

6–9 months to write

R&D status & Results	← Interim Report
Updated Reference Design	← RDR / SB2009 / AD&I
Updated value estimate	← SCRF / CFS / RDR
PIP	new
Risk Assessment	new - replaces RDR

Technical Design Documentation



- The focus of our (doc.) activities for the next 12-months
- Use TBR workshops to drive this documentation
- Structured in a WBS and
- Centrally implemented in ILC-EDMS

cf next presentation by Lars Hagge

Example: Positron Source

1.3		**Accelerator Systems**			Design, technical description and R&D program for demonstrating feasibility & performance of accelerator sub-systems	
1.3.1		Electron Source			Electron source design, technical description and R&D program	
1.3.2		Positron Source			Positron source design, technical description and R&D program	
1.3.2.1			PS Sub-Systems		Design and technical description of positron source sub-systems	
1.3.2.1.1				PS Magnets	Design and technical description of PS magnets	
1.3.2.1.2				PS RF System	Design and technical description of PS RF system	
1.3.2.1.3				PS Dumps	Design and technical description of PS dumps	
1.3.2.1.4				PS Collimators	Design and technical description of PS collimators	
1.3.2.1.5				PS Undulator	Design and technical description of PS undulator	
1.3.2.1.6				PS Target	Design and technical description of PS target	
1.3.2.1.7				PS Capture Device	Design and technical description of PS capture device	
1.3.2.1.8				PS Vacuum	Design and technical description of PS vacuum	
1.3.2.1.9				PS Remote Handling	Design and technical description of PS remote handling	
1.3.2.1.10				PS Structural Engineering	Design and technical description of PS structural engineering	
1.3.2.1.11				PS Shielding	Design and technical description of PS shielding	
1.3.2.2			PS Section Integration		Baseline layout configurations of PS sections	
1.3.2.2.1				PS Pre-Undulator	Baseline layout configuration of PS Pre-Undulator section	
1.3.2.2.2				PS Fast Abort Line	Baseline layout configuration of PS Fast Abort Line	
1.3.2.2.3				PS Undulator Section	Baseline layout configuration of PS Undulator Section	
1.3.2.2.4				PS Target Bypass Dogleg	Baseline layout configuration of PS Target Bypass Dogleg	
1.3.2.2.5				PS Auxiliary Source	Baseline layout configuration of PS Auxiliary Source	
1.3.2.2.6				PS Positron Capture Section	Baseline layout configuration of PS Positron Capture Section	
1.3.2.2.7				PS Positron Pre-Acceleration Section	Baseline layout configuration of PS Pre-Acceleration Section	
1.3.2.2.8				PS 400 MeV Positron Transer Line	Baseline layout configuration of PS 400 MeV Positron Transfer Line	
1.3.2.2.9				PS 5GeV Booster	Baseline layout configuration of PS 5 GeV Booster	
1.3.2.2.10				PS 5GeV Positron Transfer Line	Baseline layout configuration of PS 5 GeV Positron Transfer Line	
1.3.2.2.11				PS Spin Rotation	Baseline layout configuration of PS Spin Rotation	
1.3.2.2.12				PS Energy Compression	Baseline layout configuration of PS Energy Compression	
1.3.2.2.13				PS Positron Line to Ring	Baseline layout configuration of PS Transfer Line to Damping	
1.3.2.2.14				PS Positron Transfer Lines	Baseline layout configuration of PS Undulator Section	
1.3.2.3			PS Project Management		PS Project Management of the TD phase	
1.3.3		Damping Ring			Damping ring design, technical description and R&D	

WBS
(ILC-EDMS)

Example: Positron Source

1.3	Accelerator Systems	Design, technical description and R&D program for
1.3.1	Elec	
1.3.2	Pos	
1.3.2.1		
1.3.2.1.1		
1.3.2.1.2		
1.3.2.1.3		
1.3.2.1.4		
1.3.2.1.5		
1.3.2.1.6		
1.3.2.1.7		
1.3.2.1.8		
1.3.2.1.9		
1.3.2.1.10		
1.3.2.1.11		
1.3.2.2		
1.3.2.2.1		
1.3.2.2.2		
1.3.2.2.3		
1.3.2.2.4		
1.3.2.2.5		
1.3.2.2.6		
1.3.2.2.7		
1.3.2.2.8		
1.3.2.2.9		
1.3.2.2.10		
1.3.2.2.11		
1.3.2.2.12		
1.3.2.2.13		
1.3.2.2.14		
1.3.2.3		
1.3.3	Dam	

Undulator Section

Basic undulator module parameters			
Cryomodule length	4.116	m	
Effective magnet length	3.5	m	
Undulator period	11.5	mm	
Max. undulator Strength (K)	0.92		
Max. field on axis	0.86	T	
Max. required current	??	A	
Beam aperture	5.85	mm	
Lattice (Layout) parameters			
Quadrupole spacing	14.54	m	
Quadrupole strength	0.064	m^{-1}	Check!
Quadrupole length	1	m	Check!
Phase advance per cell	45	degree	Check!
Cell length	29.08	m	Check!
Maximum β funtion	46.93	m	Check!
Number of quadrupoles	22		Check!
Total lattice length	305.3	m	Check!
Total active undulator length	220.5	m	Check!

				Centre-of-mass energy E_{cm} (GeV)				
Variant	*Parameter*			**200**	**250**	**350**	**500**	**1000**
	Positron pulse production rate		Hz	5	5	5	5	4
	Electron beam energy (e+ prod.)		GeV	150	150	175	250	??
	Number of electron bunches	n_b		1312	1312	1312	1312	2625
	Electron bunch population	N_+	$\times 10^{10}$	2	2	2	2	2
	Photon energy (first harmonic)		MeV	9.3	9.3	12.6	25.8	??
	Photon openning angle (=1/γ)		μr	3.4	3.4	2.9	2.0	??
QWT capture device								
	Fixed undulator field scenario							
	Required effective undulator length	L_{und}	m	231	231	150	75	??
	Number of active modules			66	66	43	22	??
	Actual active length		m	231.0	231.0	150.5	77.0	??

Info | Primary requirements | Electron drive beam | **Undulator Section** | Production Target | Photon Coll

Parameter tables
ILC-EDMS D*943695

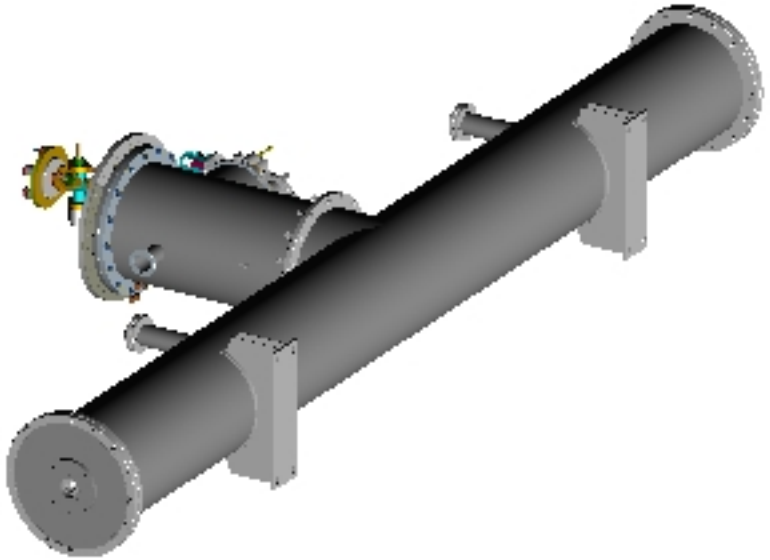
Example: Positron Source

1.3	Accelerator Systems	Design, technical description and R&D program for
1.3.1	Elec	
1.3.2	Pos	
1.3.2.1		
1.3.2.1.1		
1.3.2.1.2		
1.3.2.1.3		
1.3.2.1.4		
1.3.2.1.5		
1.3.2.1.6		
1.3.2.1.7		
1.3.2.1.8		
1.3.2.1.9		
1.3.2.1.10		
1.3.2.1.11		
1.3.2.2		
1.3.2.2.1		
1.3.2.2.2		
1.3.2.2.3		
1.3.2.2.4		
1.3.2.2.5		
1.3.2.2.6		
1.3.2.2.7		
1.3.2.2.8		
1.3.2.2.9		
1.3.2.2.10		
1.3.2.2.11		
1.3.2.2.12		
1.3.2.2.13		
1.3.2.2.14		
1.3.2.3		
1.3.3	Dam	

	A	B	C	D	E	F	G	H	I
1	**Undulator Section**								
2									
3		Basic undulator module parameters							
4		Cryomodule length	4.116	m					
5		Effective magnet length							
6		Undulator period							
7		Max. undulator Strength							
8		Max. field on axis							
9		Max. required current							
10		Beam aperture							
11									
12		Lattice (Layout) paramet							
13		Quadrupole spacing							
14		Quadrupole strength							
15		Quadrupole length							
16		Phase advance per cell							
17		Cell length							
18		Maximum β funtion							
19		Number of quadrupoles							
20		Total lattice length							
21		Total active undulator le							
22									
23									
24									
25									
26	*Variant*	*Parameter*							
27		Positron pulse production							
28		Electron beam energy (e+							
29		Number of electron bunc							
30		Electron bunch populatio							
31									
32		Photon energy (first harm							
33		Photon openning angle (=							
34									
35	QWT capture device								
36		*Fixed undulator field sce*							
37		Required effective undulator length	L_{und}	m	231	231	150	75	??
38		Number of active modules			66	66	43	22	??
39		Actual active length		m	231.0	231.0	150.5	77.0	??

Info | Primary requirements | Electron drive beam | **Undulator Section** | Production Target | Photon Coll

CAD models (e.g. SC helical undulator)
ILC-EDMS D*964203



Technical Baseline Reviews

- **The next "thing" after TLCC**
- **Similar format to TLCC BAW but reduced scope**
  - next-level of design decisions
  - PM (not Director) driven
- **two-day focus workshops**
  - face-to-face for key (mandatory) participants, but
  - open meetings to all who wish to attend
  - Webex available
  - Written detailed summaries to be provided

Open and transparent process

TBRs: Scope and Goals

- **Systematic and comprehensive review of proposed (TDR) baseline**
- **Identification of outstanding issues**
  - design decisions
- **Consolidate baseline decisions**
  - May include ‘downselects’ between alternatives
  - Clear identification of supported “options” (site dependencies)
  - Clear identification of alternatives (R&D – similar to RDR)
- **Review CFS requirements**
- **Review Cost**
- **Identify and prepare baseline documentation for the TDD (ILC-EDMS team)**

TBRs are the end of the process.
The beginning is this workshop.

TDR Technical Baseline Reviews

- **Dates and venues:**

Baseline Technical Reviews		
Area / Group	When	Where
DR	7-8 July, 2011	INFN
RTML	24-25 Aug 2011	Fermilab
BDS	Fall 2011	DESY
Sources	Fall 2011	SLAC or ANL
SCRF / Main linac integration	Winter 2011 / 2012	KEK
CFS	Winter 2011 / 2012	Fermilab

- **Physics and Detector to be represented**

Questions for discussion

- **Baseline issues (design decisions)**
  - Start to make lists of things that need to be decided
  - Attempt to make an “impact statement” of their importance
- **Resources – understanding what we can really do**
- **Cost estimation**
  - where do we expect updated (i.e. really new) estimates to replace RDR
  - How much will just rely on re-scaling (component counts)
- **Generating documents**
  - (nobody likes doing this!)
  - Keep additional (new) documentation to a minimum
  - But key documents identified as “missing” will need to be supplied