

HLRF *EDR R&D* Work *Packages*

Prepared for

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For the ILC HLRF Collaboration

EDR Challenge

- EDR definition implies that interim 08-10 period must be sufficiently staffed, funded to achieve “EDR Readiness” by 2010.
- Requires leadership, strong contributions and collaboration from all Regions
- Requires active involvement of industrial partners
- Building inter-regional and lab-industry collaboration through Work Packages critical to meeting EDR goals.

Definitions: *Management & R&D* WP's

- **Two Task Categories for each WP**
 1. *EDR WP - Management:*
 - Subsystem Engineering leaders perform following tasks:
 1. R&D & Overall Project Plans
 2. Cost Analysis & Schedules
 3. Manufacturing & Installation Models
 4. Develop EDR Report
 5. Develop Bid Packages for all Regions (w/R&D)
 6. Build-to-print for first ACD's
 7. Recommend down-selection (or not)
 2. *R&D WP – ACD Prototypes:*
 - Organize collaboration, design, build, test prototypes
 - Documentation for Build-to-Print, Specifications
 - Develop Vendors via prototype procurement
 - Assist Bid Package development. Industry liaison

HLRF Component Work Packages

ACD System	Mgmt WP	R&D WP
Klystron SBK	1	1
Marx Prototype	1	1
Marx DFM	1	1
Power Distribution	1	1
Charger PSS	1	1
Interlocks & Controls	1	1

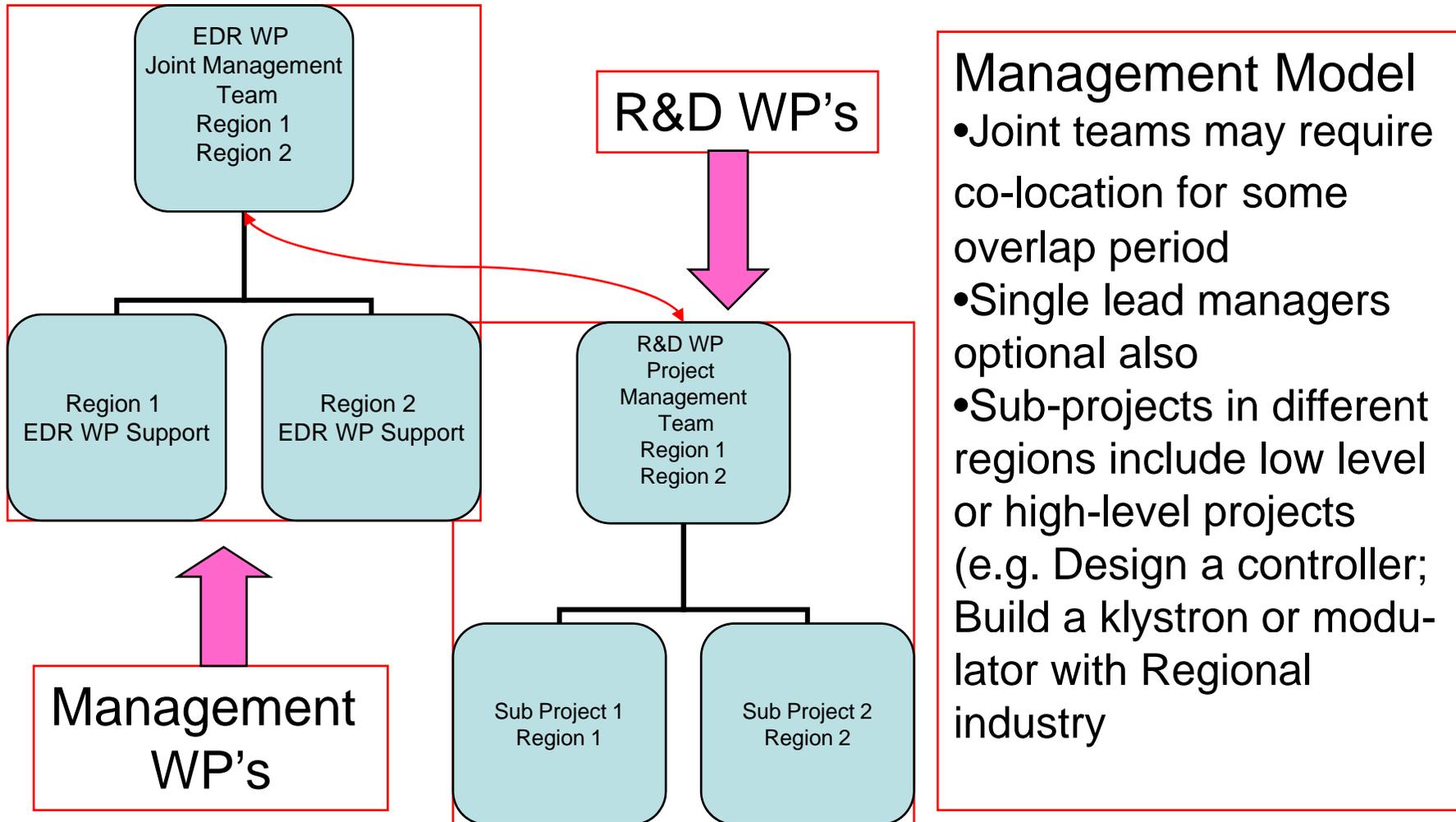
Example *R&D* Work Packages - Marx

High Level RF Work Packages		2006	2007	2008	2009	2010	2011	2012	2013	2019
		RDR	EDR			Approval		Construction	Commiss.	
1	EDR Work Packages									
	<i>Marx Modulator</i>									
	Complete 08-09 Work Packages		◆							
	Down-select technology			◆						
	Prepare bid packages for 3 Regions			◆						
	Place factory orders in 3 Regions			◆						
	Receive units in 3 Regions				◆					
	Implement Test Stands 3 Regions					◆				
	Test Stand operation 3 Regions						-----			
2	R&D Work packages									
	<i>Marx Modulator</i>									
	Complete prototype power test			◆						
	Complete DFM design			◆						
	Complete DFM Prototype				◆					
Implement DFM Prototpe on Test Stand					◆-----					

R&D WP Schedule Example Marx

ID	Task Name	Duration	Start	Finish	2007				2008				2009			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	EDR WORK PACKAGES - HA ELECTRONICS	705 days	Wed 6/27/07	Tue 3/9/10												
2																
3	E1. Magnet Power Supplies & Controller Systems	558 days	Wed 6/27/07	Fri 8/14/09												
4	<i>E1.1 EDR Management Power Supply Systems</i>	<i>558 days</i>	<i>Wed 6/27/07</i>	<i>Fri 8/14/09</i>												
5	<i>E1.1.1 Develop R&D & Overall Project Plans</i>	<i>558 days</i>	<i>Wed 6/27/07</i>	<i>Fri 8/14/09</i>												
35	<i>E1.2 EDR R&D Power Supply Systems</i>	<i>558 days</i>	<i>Wed 6/27/07</i>	<i>Fri 8/14/09</i>												
50	E2. Marx Modulator ACD (Alternate Conceptual Design)	705 days	Wed 6/27/07	Tue 3/9/10												
51	<i>E2.1 EDR Management Marx</i>	<i>498 days</i>	<i>Wed 6/27/07</i>	<i>Fri 5/22/09</i>												
52	E2.1.1 Revise Marx R&D Plan, cost, schedule for EDR Phase	30 days	Wed 6/27/07	Tue 8/7/07												
53	E2.1.2 Requirements Document for DFM	30 days	Wed 8/8/07	Tue 9/18/07												
54	E2.1.3 Specifications Document for DFM	30 days	Wed 9/19/07	Tue 10/30/07												
55	E2.1.4 Develop EMC Plan, Cost & Schedule for Project	60 days	Mon 3/3/08	Fri 5/23/08												
56	E2.1.5 Develop Bid Packages for Industrial Prototypes	60 days	Wed 11/5/08	Tue 1/27/09												
57	E2.1.6 Develop EDR Report for Modulators	60 days	Mon 3/2/09	Fri 5/22/09												
58	<i>E2.2 EDR R&D Marx Prototype 1 & DFM 1</i>	705 days	Wed 6/27/07	Tue 3/9/10												
59	E2.2.1 Complete, test Vernier pulse flattener Proto 1	30 days	Wed 6/27/07	Tue 8/7/07												
60	E2.2.2 Complete assembly in enclosure Proto 1	20 days	Wed 8/8/07	Tue 9/4/07												
61	E2.2.3 Complete full power tests Proto 1	90 days	Wed 9/5/07	Tue 1/8/08												
62	E2.2.4 Complete design DFM Proto 2	120 days	Wed 9/5/07	Tue 2/19/08												
63	E2.2.5 Complete Construction DFM Proto 2	120 days	Wed 2/20/08	Tue 8/5/08												
64	E2.2.6 Commission DFM Proto 2	30 days	Wed 8/6/08	Tue 9/16/08												
65	E2.2.7 Install in Test Stand ESB DFM Proto 2	20 days	Wed 9/17/08	Tue 10/14/08												
66	E2.2.8 Documentation for DFM Bid Packages	30 days	Wed 10/15/08	Tue 11/25/08												
67	Bid Packages Ready DFM Industrial Protos	0 days	Tue 1/27/09	Tue 1/27/09												
68	E2.2.9 Procure DFM Prototypes 3 Regions	250 days	Wed 1/28/09	Tue 1/12/10												
69	E2.2.10 Install in Test Stands, Commission	40 days	Wed 1/13/10	Tue 3/9/10												

Example Collaboration Concept



Management Model

- Joint teams may require co-location for some overlap period
- Single lead managers optional also
- Sub-projects in different regions include low level or high-level projects (e.g. Design a controller; Build a klystron or modulator with Regional industry)

R&D WP Collaboration Opportunities

- **Marx Modulator Collaboration**
 - *DFM design*
 - *First prototype construction & test*
 - *Industry collaboration plan, documentation, bid packages for Build-to-Print*
 - *Building prototypes w/ industry in Regions*
- **SBK Klystron & RF Drive Collaboration**
 - *Same items as above*
- **Distribution System Collaboration**
 - *Same items as above*

R&D WP Collaboration- cont'd

- **Charger System (6-Pack) Collaboration**
- **a. Motivation:**
 - Solve issue of excessive harmonic distortion of power mains
 - Reduce costs (modestly)
- **Collaboration on:**
 - *Requirements, specification documents*
 - *Design reviews of overall system design, custom primary transformer, secondary converters*
 - *Design, testing of first prototype*
 - *Industrialization bid packages Build-to-Print*
 - *Construction of prototypes offered in Regions*

- **Interlocks & Controls System**
 - *Motivation: Develop system based on latest technology for HA design*
 - Redundancy of critical chains
 - Self-testing of all signal sources, cable links
 - System level diagnostics
 - FPGA based logic implementation to Safety System standards
 - High security, high availability
- **Collaboration on:**
 - *Design requirements, specification documents, system requirements, hardware & software*
 - *Unit & system level design reviews*
 - *Development, testing of first prototypes*
 - *System-level testing into control system*
 - *Industrialization plan*
 - *Preparation of bid packages for industrial procurement offered in Regions*

R&D WP Summary Remarks

- **Technical Challenges**
 - *ACD R&D vital to cost reduction, performance improvements*
 - *Most modern technology available needed for ILC in all areas for HA designs*
- **Collaboration Challenges**
 - *Forming effective inter-Regional R&D project engineering teams essential*
 - *Transition from prototypes to industry essential*