Summary of TDR Cost Reviews at KILC-12

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TDR Cost methodology

- TDR cost estimate will be in 2012 ILCU, defined as USD of Jan 1, 2012, and related to other currencies using purchasing power parity conversions to USD as of that date.
- For all technical systems excluding L-band SCRF: Use escalated unit RDR costs with quantities modified as defined by TDR design for sources, RTML, ML , BDS, Cryogenics, and some DR systems
- DR magnets, power supplies, vacuum system: new estimates
- CFS: New estimates for civil engineering, electrical and mechanical systems, for Asian and American sites; new estimates for civil only for European site.
- L-band SCRF High-level RF: new estimates for KCS (klystron cluster) and DKS (distributed klystron) designs
- L-band SCRF Cavities and cryomodules: new estimates
- Approximate 75% of the TDR cost estimate will be new; the remainder will be based on escalated RDR unit costs.

Area system cost reviews (1)

- Electron source:
  - Increase in length of ELTR (transfer line to DR)
  - Increase in modulator for warm (buncher) RF for 10 Hz
  - Estimated change in system cost from RDR: +4%
- Positron source:
  - Eliminate 10%-intensity Keep-Alive Source (KAS)
  - Eliminate ~5 km of 400 MeV transfer line
  - Add ~1%-intensity KAS
  - Estimated change in system cost from RDR: -25% (excluding remote handling system, TBD)
- Damping rings
  - Reduce magnets due to ring circumference reduction from 6.4 to 3.2 km
  - Reduce RF system cryomodules and HLRF
  - Implement distributed power supply system

Area system cost reviews (2)

- Damping rings (con't)
  - Implement vacuum system with full electron cloud mitigation features (estimate still in development)
  - Estimated change in system cost from RDR: ~-15%
- RTML:
  - Increase in length of main transport line
  - Additional RF unit for each bunch compressor (10 Hz)
  - Estimated change in system cost from RDR: +5%
- ML (excluding SCRF):
  - No changes
- BDS
  - Not reviewed: expect minimal changes from RDR
- Cryogenics
  - Not reviewed: expect change from RDR: 8 cryoplants -> TDR: 10 (smaller) cryoplants (+5% of system cost)

Conventional facilities cost reviews

- Reviewed new estimates for Americas civil, mechanical and electrical conventional facilities
  - Civil: single circular tunnel, with KCS HLRF configuration
  - Supporting electrical and mechanical designs (based on contractor estimates)
  - Estimated change in system cost from RDR: ~-20%
- Reviewed new estimates for Asian civil, mechanical and electrical conventional facilities
  - Civil: Kamaboko tunnel, with DKS HLRF configuration
  - Supporting electrical and mechanical designs (based on contractor estimates) (full power)
  - Estimated change in system cost from RDR: TBD

Technical systems cost reviews: L-band High-level RF

- New 10 MW Multi-beam klystron estimate based on vendor quotes: approximately the same unit cost as RDR.
- New modulator (Marx) estimate based on fabrication costs from SLAC: lower unit cost than RDR.
- Two power distribution system designs: klystron cluster (KCS) and distributed klystron (DKS).
  - Both DKS and KCS use less klystrons and modulators than the RDR
  - Both DKS and KCS use the same local PDS, which is more complex (and expensive) than RDR due to need to deal with cavity gradient spread.
  - KCS requires long waveguides to distribute power from surface sites to the tunnel, and also more klystrons and modulators than DKS due to increased losses.
- Estimated change in system cost from RDR: ~+4% for KCS, ~-19% for DKS.

Technical systems cost reviews: L-band Cavities and Cryomodules

- New cavity and cryomodule estimates will be based on
  - Estimates from 2007
  - Actual costs from EXFEL cavity procurements and cryomodule assembly experience, and from FNAL cryomodule fabrication
  - Current vendor quotes for cavities and SC material
  - New industrial studies in Europe (Research Instruments, Zanon), Japan (Mitsubishi, Toshiba, Hitachi) and US (Advanced Energy Systems)
  - All studies expected to be completed by early summer
- Considerable effort is still required to understand and reconcile results from these studies.
- The new estimate for cavities and cryomodules will be more robust and mature than was possible for the RDR.

Conclusions

- TDR cost estimate development is well underway.
- Significant cost reductions for positron source and DR.
- Area system estimates still pending: positron source remote handling, DR vacuum system, BDS and Cryogenics.
- Major cost reductions for CFS.
- Some cost reduction in HLRF system for DKS configuration.
- New estimates for cavities and cryomodules still being developed; basis of estimate will be much more extensive than for the RDR.