**DRAFT** Input_Area_Systems.doc Peter H. Garbincius 1jan06

What do we need specified, and when from each Area System?
We will also need special information from Global Systems.

An important thing is to ***define the interfaces*** between each Area System, Technical System, and Global System, from both directions. This needs to be physical boundaries, and also machine parameters such as emittances, momentum spreads, TWISS parameters, and polarizations at each hand-off. This needs definition so both sides of the interface know what is expect of them, and to track emittance preservation along the accelerator complex.

Assume that Area System groups have responsibility for bringing all needed Technical System groups to bear on producing their section of RDR document and cost estimate

Each **Area System** group needs to supply:

MAD file (or equivalent)
Layout sketch (actually a finished drawing will be needed soon)
of repeated section (showing lengths, etc.) and number of sections
and details (sketch/drawing) of any special inserts or sections
Component list: description, #, type, etc,
Field, gradient, sextupole requirements for main magnets
With uniformity, multi-pole, aberration requirements
Remember that this initial stage will be for 2*500 GeV operations later
Aperture requirements
Current requirements – how many circuits (or engineering optimization?)
Power supply regulation/accuracy/reproducibility? 0.001%, 0.0001%?
Size of vacuum pipe and vacuum requirements (can vary with position)
RF systems needed.
***Specific*** controls and instrumentation (in addition to Global Controls & Instrum)
Tunnel requirements, both transverse and longitudinal:
special wider sections, laser straight sections, any special access areas.
where are RF cavities, Klystrons, Modulators located
for DR and e+ and e- sources located?
What collimators and beam dumps are needed? for normal running,
machine protection, personnel protection, commissioning or debugging
be sure to include:
stands, installation, cables
power requirements (amps, volts, voltage drops, power)
cooling water –heat rejection
temperature, $\Delta T$, flow, pressure

*** Outline of proposed chapter for RDR document (will evolve with time)
should include
accelerator performance requirements

definitions of boundaries/interfaces/ and I/O beam parameters
brief overview (maybe full description)
accelerator physics - how design works, meets requirements
statement of status of beam design, components, production
questions and issues still outstanding
prior R&D accomplishments
current activities: R&D, industrial studies
what is keeping us from implementing this now! (beside availability of funding)
what are the risks? (e.g. can't get 10 MW, or 35 MV/m)
how do we treat them?
These topics should be discussed for baseline configuration elements
and also for alternate configuration elements
(but can be more sketchy for ACD since more R&D needed)
but should say why Alternates are being investigated, e.g.
promise of enhanced performance, reduced cost, improved availability
Discuss effect and remediation of "problems"
such as drop-out of klystron, coupler, quadrupole, trim
with how many off can you still operate (installed redundancy)?
what will be affect of retuning?

**DCB** will provide a skeleton Work Breakdown Structure (WBS) but Area Systems and
Global Systems groups will add their more detailed specific elements
need WBS dictionary: for each element: description, boundaries and interfaces,
and what is in, what is NOT in that element

<u>Cost estimates</u> (will evolve with time) with description of <u>basis of estimate</u>
say how cost estimate was obtained – fill out "risk questionnaire" for each cost est
DCB can use the answers to these risk question to find suggested contingency

What quantity reduction of unit price was used (learning curve)?

what will **DCB** do with these uncertainties?
There are differences between uncertainties
(non-symmetric: might cost 100% more, but not 100% less)
and contingencies (take into account incomplete engineering
specifications and cost estimating, by increasing cost)
can politicians understand 50-50% chance of final cost being above/below
quoted value? Can we generate such an estimate?

<u>reliability/availability requirements</u> assumed for components & systems
How would the cost/design/delivery vary
if MTBF and MTTR differed by a factor of 2?

estimate of <u>Manpower</u> need – for collaborating institutions manpower,
need number of Full Time equivalent years
# FTEs of each type of manpower vs system vs. year into construction

treat contracted people the same as material purchases
Types - RF, cryo, controls, mechanical, electrical power engineers
technicians, scientists, programmers, administration, alignment
Time profile of manpower need

Schedule (assume Technically driven, not funding limited, for now)
DCB will provide: Should we determine # years from top? TESLA had 8 years
Design
Prototyping
Fabrication/Procurement
Testing/acceptance/conditioning
Installation
Commissioning
(see prior reference documents TESLA & USLCTOS)

**DCB** will need to propose a production model:
How many vendors? Constrained to regions or free market pricing?

**Global System groups** will have integration responsibility across Area Systems, and must cover these topics:
Dumps and beam stops
Machine Protection
Personnel protection
Global (common) Controls
Global (common) Instrumentation
Staged installation
Partial commissioning
Reliability and Availability
Conventional Facilities and Site.

Barry – need to consider:
Integration, boundaries, interfaces
Overview
Overall vision or concept of entire project, rather than individual designs
What is left out, optimization
DON'T FORGET DETECTORS
What are detectors contributing to RDR?
Multiple designs, single design, composite average of N-designs?
What level of detail, costing methodology?
Accelerator and Dectector(s) need to be treated consistently

Tor: watch out for
resource conflicts,
Inconsistencies
Global view
Matching between subsystems