Beta-Beam Costing Exercise

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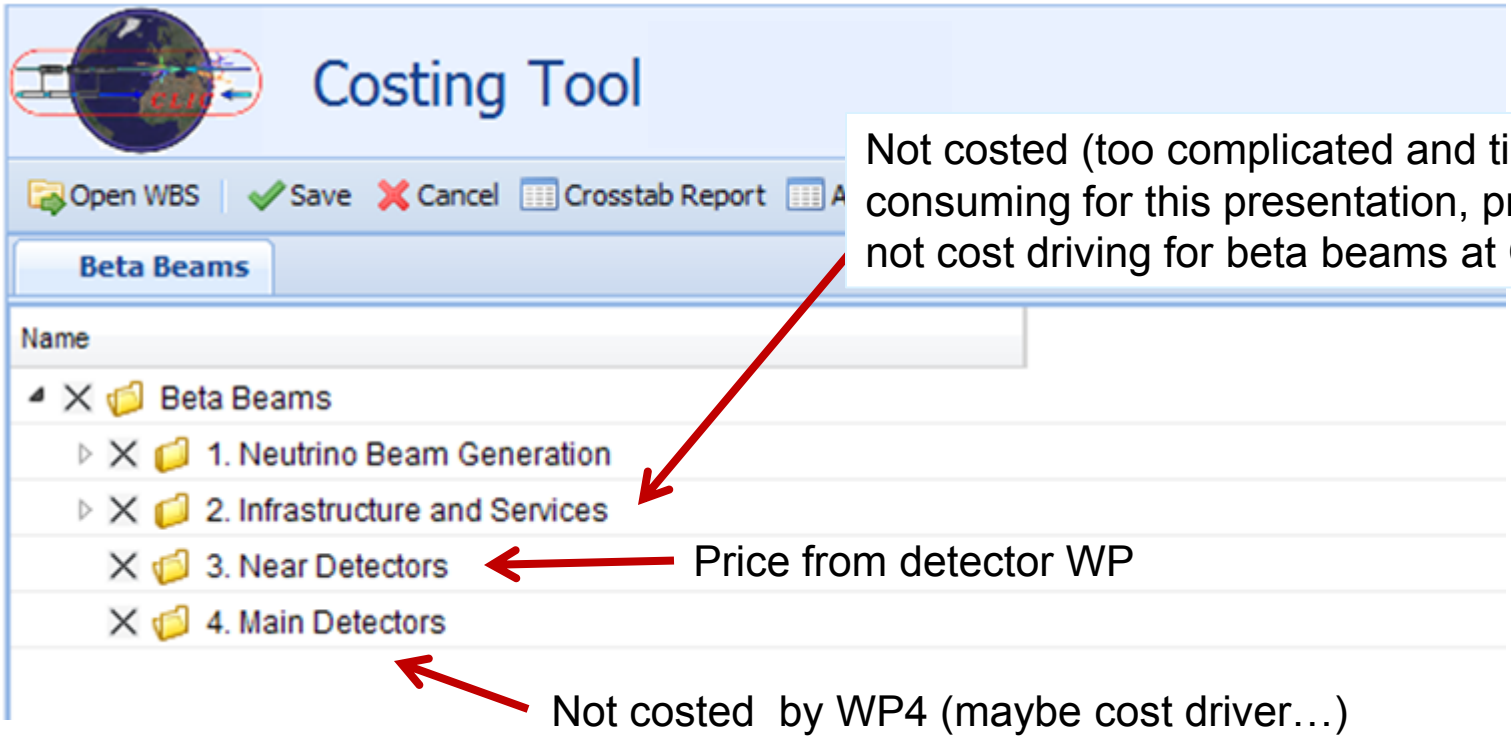
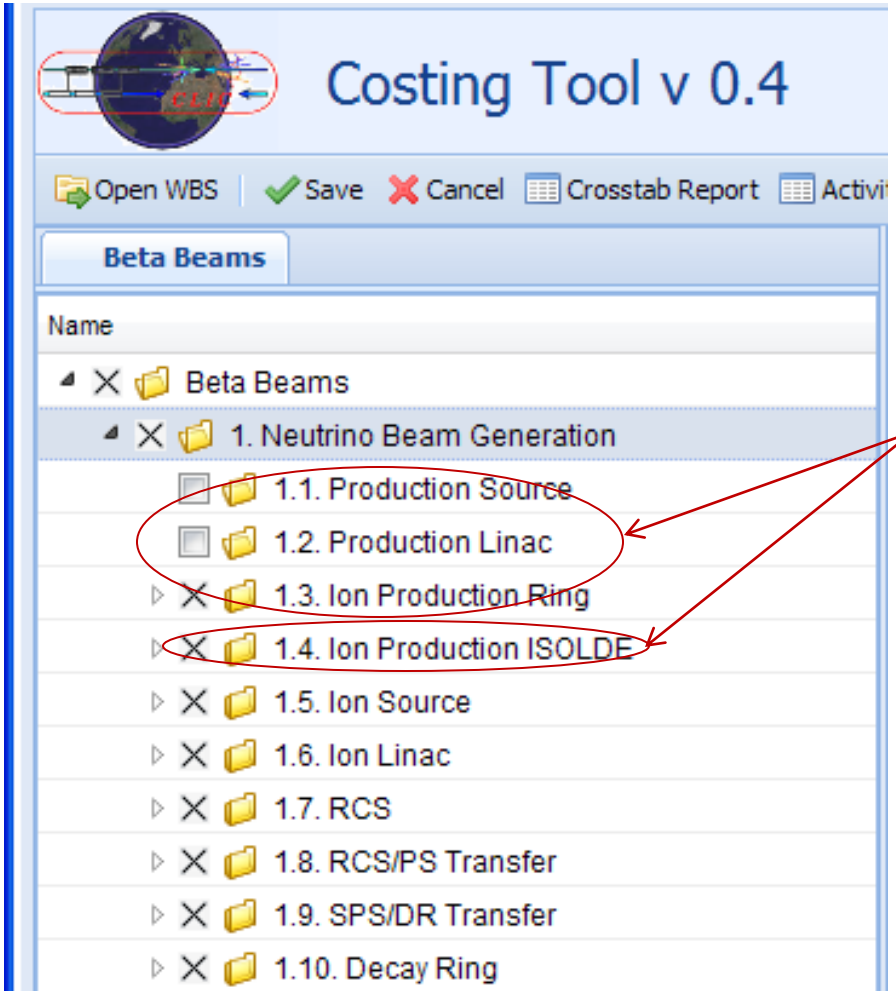
First Steps to Costing, 2010

- What was asked for
  - PBS to 3rd level (assemblies)
  - Cost Drivers
- WBS
  - Infrastructures: some attached to WBS, some in separate structure
    - Needs sorted out how to treat this problem
- Cost Drivers
  - Probably Civil Engineering and SC magnet systems for the Decay Ring
  - Technical Challenges (RF, Impedances)

Project Beta Beam Level 1



Project Beta Beam Level 2



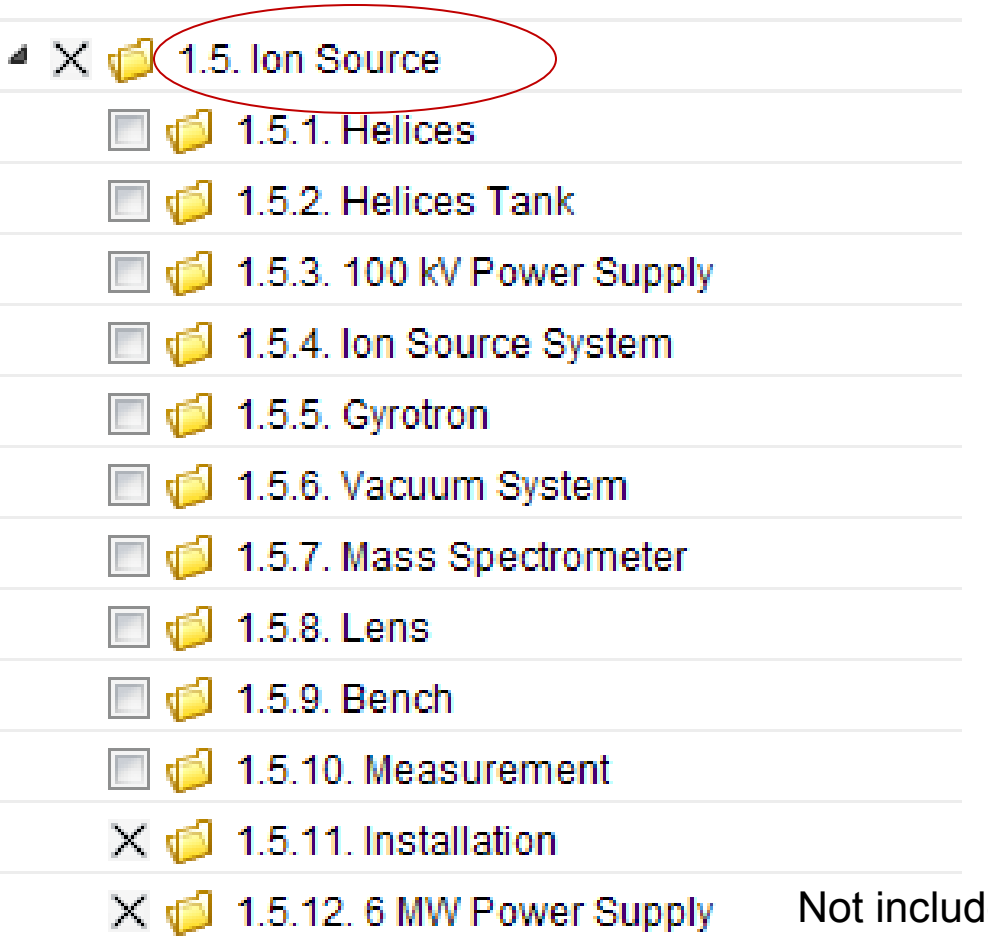
- Options, how to represent?
- Cold be interesting to flag options to avoid cloning
- Ion Production Not Costed
  - ISOLDE shared infrastructure ?

Infrastructures Services

- 2. Infrastructure and Services
  - 2.1. Civil Engineering
  - 2.2. Electricity
  - 2.3. Access and Communication
  - 2.4. Fluids
  - 2.5. Ventilation
  - 2.6. Transport and Installation
  - 2.7. Safety
  - 2.8. Survey
  - 2.9. Machine Operation
  - 2.10. Surface building 1

Other infrastructures included ?

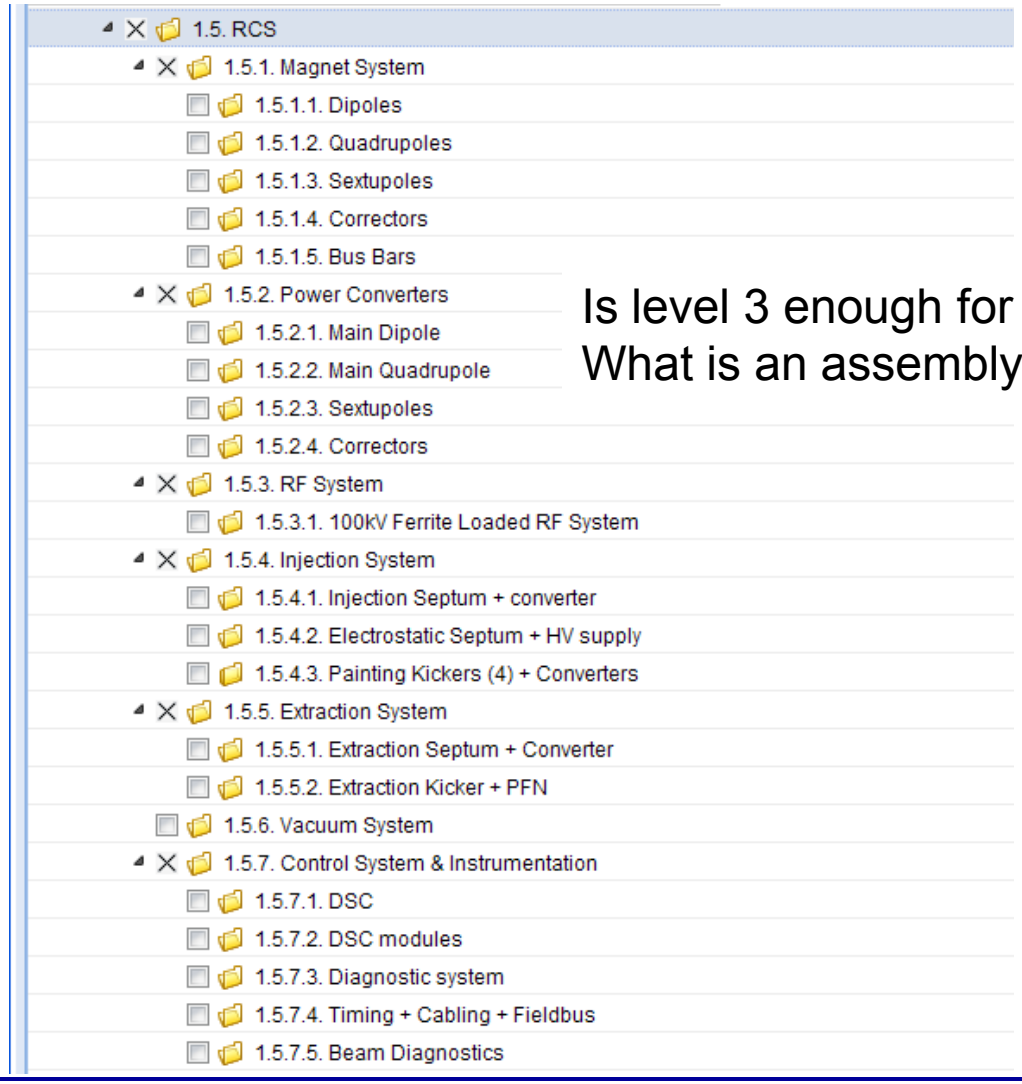
Project Beta Beam Level 2/3



Courtesy T. Lamy

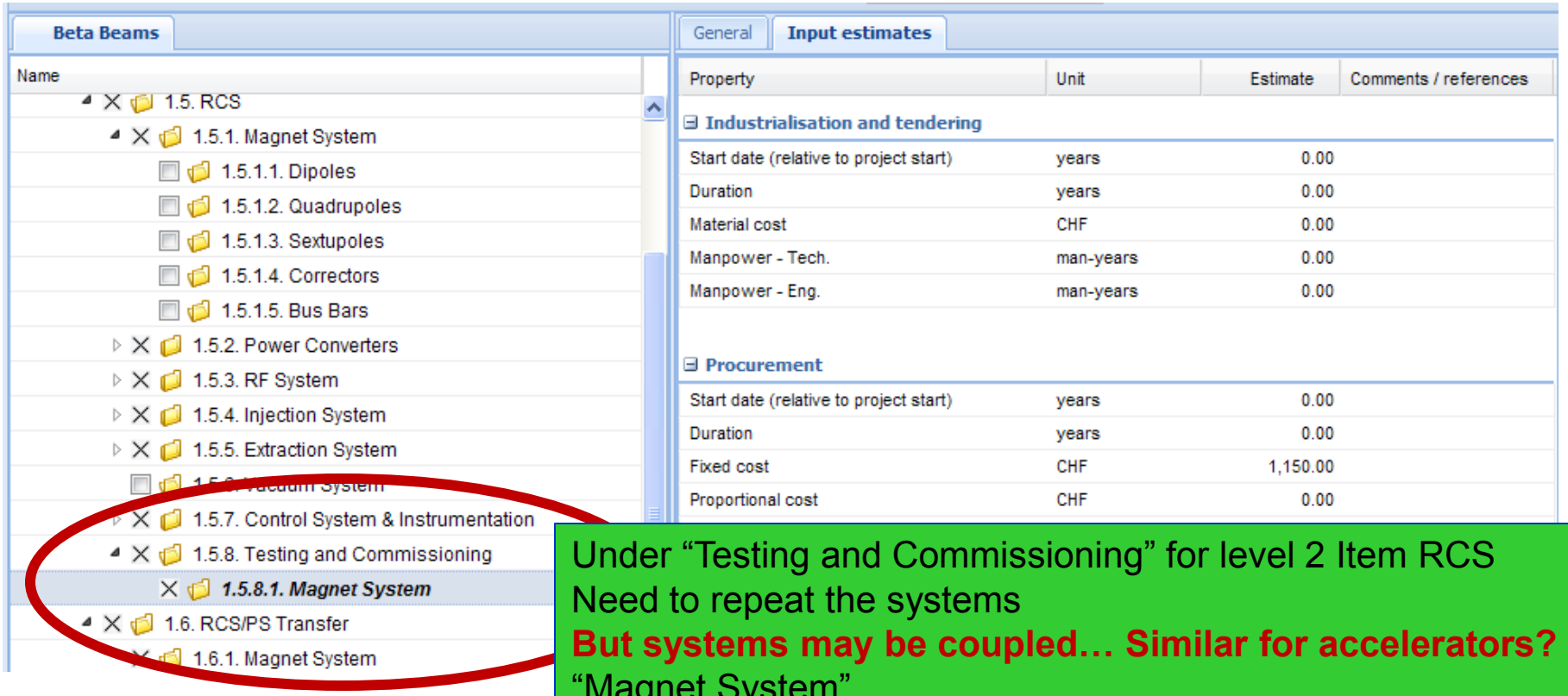
Not included!

Project Beta Beam Level 3/4



Is level 3 enough for “assemblies” (definition) ?
What is an assembly ?

Structuring…



Under “Testing and Commissioning” for level 2 Item RCS
Need to repeat the systems
But systems may be coupled… Similar for accelerators?
“Magnet System”
“Power Converters”
etc.

Not in PBS & Costing (yet)

- Manpower
- Running Costs
- Maintenance
- Dismantling
- Existing machines: specific upgrades
- Sharing of existing infrastructure
- Contingency (30% ???)
- Surface buildings (3000 ChF/m2 in Geneva)

- Etc.
- Production part not included yet

Safety & RP

- **Two cases: New machines-Existing machines**

- Existing machines:
- The case for beta beams has to be integrated/enhanced

- Safety in general:
  - Integration would not, to first order, change the safety system
- RP:
  - Absorber & Collimators may need to be added
  - Not the same activation, new calculations and considerations
  - The PS, the RCS and the Decay Ring are looked at, not collimation
  - Absorber & Collimators may need to be added

- New machines: see next slides

Safety, what is needed

1. Safety systems for warm machine:
    1. access system
        1. access control system
        2. access safety system
    2. Fire detection system
    3. Evacuation alarm system
    4. Gas detection

2. Safety systems for cold machine
    1. 1. access system
        1. Access control system
        2. Access safety system
    2. Fire detection system
    3. Evacuation alarm system
    4. Gas detection
    5. Oxygen deficiency hazard detection system

Electrical risks are not covered by these systems. Powering systems may be interlocked with the access system.

Cryogenic risks are only covered in the case of accidental release inducing oxygen deficiency.

Add a general alarm monitoring system that collects all level 3 alarms (life threatening) to the Safety control room."

RP, what is needed

1. Environment:
    1. Stray radiation -> dose to public
    2. Releases of radioactivity by air into the environment - > dose to public Releases of radioactivity by water into the environment -> dose to public Incident and accident scenarios -> dose to public
2. Workers:
    1. Shielding -> prompt ionizing radiation -> dose to worker
    2. Air activation -> dose to workers
    3. Water activation (infiltration water, cooling water), -> dose rates around beam pipes and ion exchangers
3. Induced radioactivity in accelerator components
    1. Activated fluids and contamination risk (closed circuits, etc.)
    2. Optimized design of components (material composition, optimized design for maintenance and repair)
    3. Optimized handling of devices, remote handling Ventilation and pressure cascades
4. Estimate of doses to workers and total, collective dose....
5. Remote Control
6. Interlocks and access
7. Radiation monitoring System (like RAMSES)
8. Buffer Zones for Cool Down Repair Workshop (access control, filters, fire proof…)
9. Dismantling and Radioactive waste treatment (high costs!)
10. Operational Dosimetry system
11. Individual monitoring Laboratory for analysis of environmental samples and radioactive samples
12. Closed systems (cooling water?)
13. Dismantling and Radioactive waste treatment (high costs!)

Cost Drivers

- Tunnel/Shaft digging
- Superconducting magnets
- Proton Driver
  (not part of PBS, to be shared ?…)

Templates for specification

- From RAL meeting: we need to specify HW
  - Classify equipment and make template
  - Where do we store this template
  - Should reasonably be part of WBS

https://pptevm.cern.ch/costing/gwt/cern.ppt.wbs.WBSTree/WBSTree.html

How to make it work (at CERN)

- We must now set up a team common for all WPs
- We must know how to get the help we need
- We must have the HW templates accessible

  - We need a clear mandate to knock on doors
  - We need the HW experts
  - Civil Engineering is a cost driver!
  - …and the help to cost objects, assemblies
  - …and evaluate R&D part
  - …and to cost integration (existing infrastructure)
  - Clear guidelines, similar for all 3 facilities

Thank you for helping WP4

- M. Benedikt (RCS Costing)
- R. Garoby (Costing example)
- B. Daudin (Costing Tool Introduction & Setup)
- J. De Jonghe (Costing Tool)
- Luigi Scibile