CLIC power update status

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What is there

- CLIC power has been estimated for the CDR (2012) by J.-B. Jeanneret
- Parameterized model has been developed (J.-B. Jeanneret, CLIC-note-990 (2013))
- This model has been used for CLIC re-baselining optimization and for power estimate in staged CLIC (Yellow report: CERN-2016-004)
- In the view of the preparation for European Strategy update, this model needs to be reviewed for completeness and updated if needed

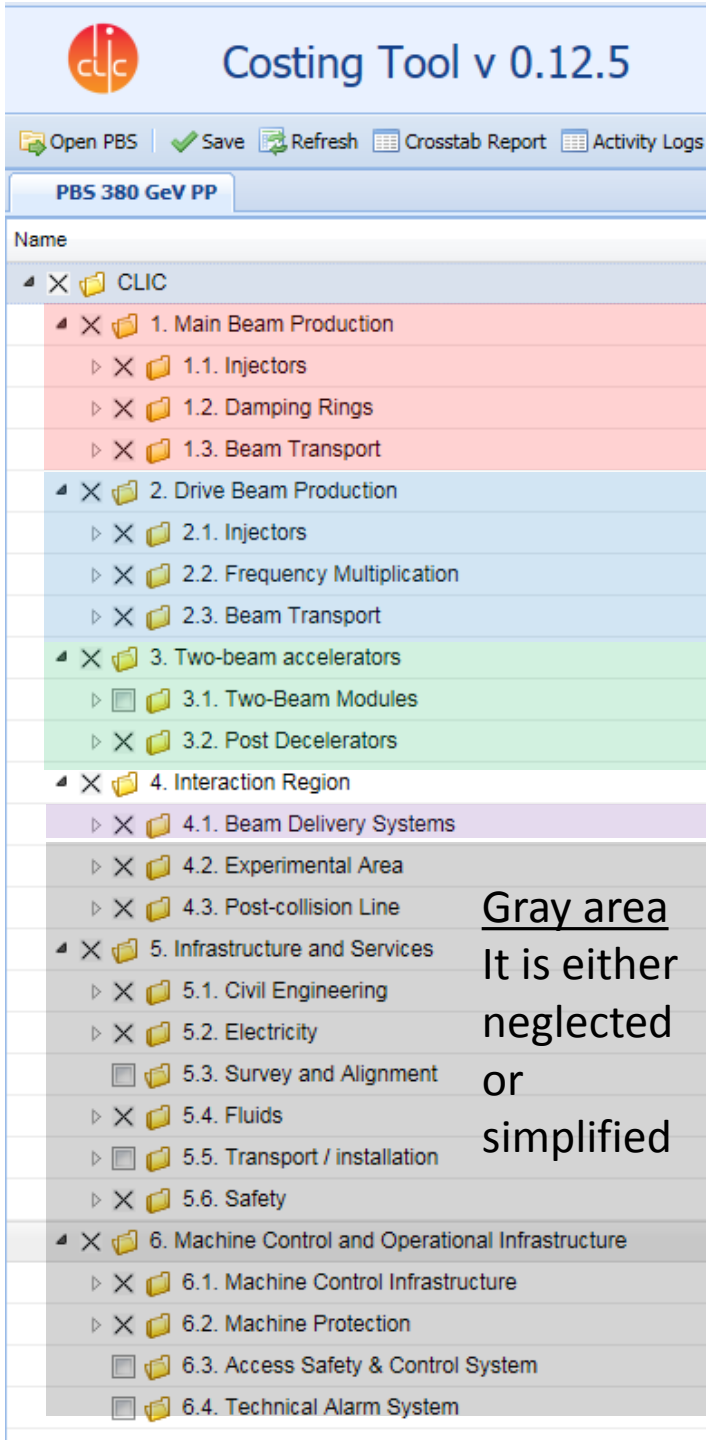
Completeness: high level

1. Use CERN costing tool PBS for checking completeness of the model

Table 2: *The breakdown of CLIC in different systems (upper part) and components (bottom part).*

1	DB_inj	The drive beam linac
2	MB_inj	The main beam production complex (linacs and positron production)
3	MB_pdr	The main beam pre-damping ring(s)
4	MB_dr	The main beam damping rings
5	MB_tttu	The main beam transfer to tunnel , including the booster linac
6	DB_fm	The drive beam frequency multiplication
7	DB_tttu	The drive beam transfer to tunnel
8	MB_titu	The main beam transfer in tunnel,
9	DB_titu	The drive beam transfer in tunnel , including turn-arounds
10	DB_ldl	The drive beam long delay line, including one turn-around
11	DB_postd	The spent drive beam extraction and the dump
12	ML_mb	The main beam part of the main linac
13	ML_db	The drive beam part of the main linac
14	ML_bd	The main beam delivery line
15	BI+CO	Overall beam instrumentation and control
c1	RF	The radio-frequency power, including the klystron and modulator losses
c2	MAGNET	The magnet power, including the rectifier and transport losses
c3	CV WATER	The power of the water cooling system
c4	CV AIR	The power of the air ventilation and its heating/cooling system

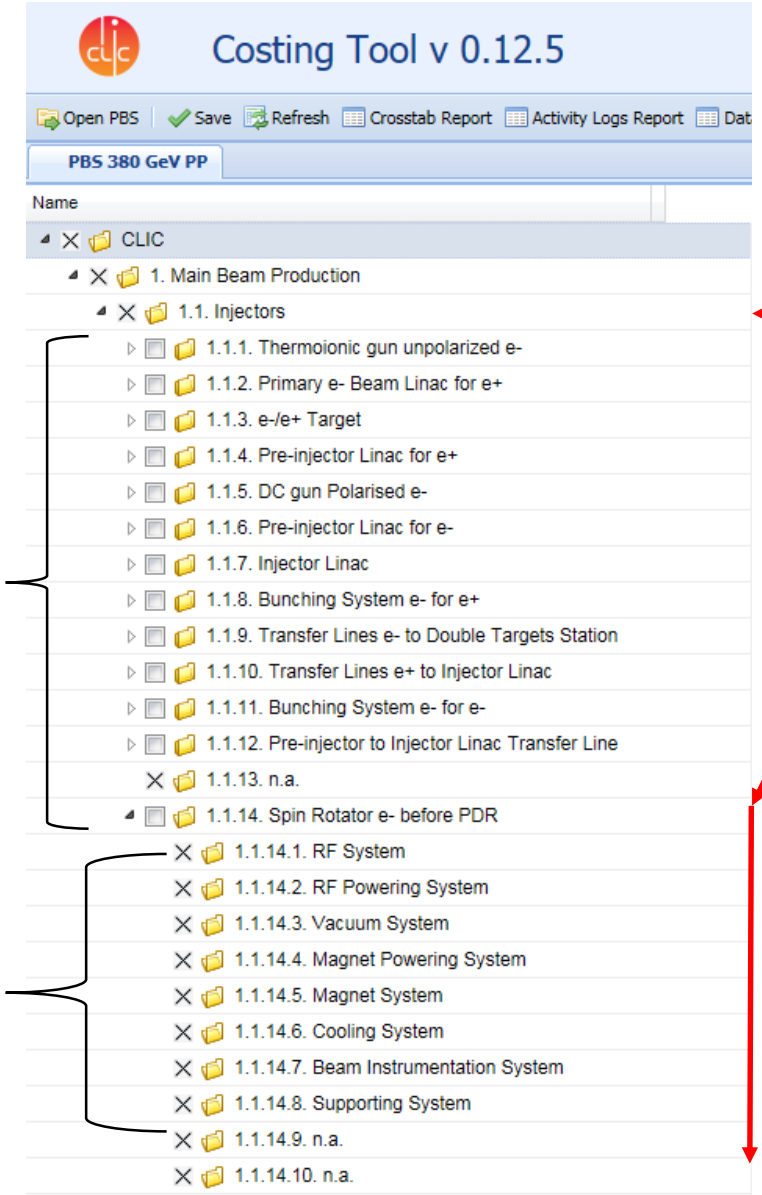
J.-B. Jeanneret, CLIC-note-990 (2013)

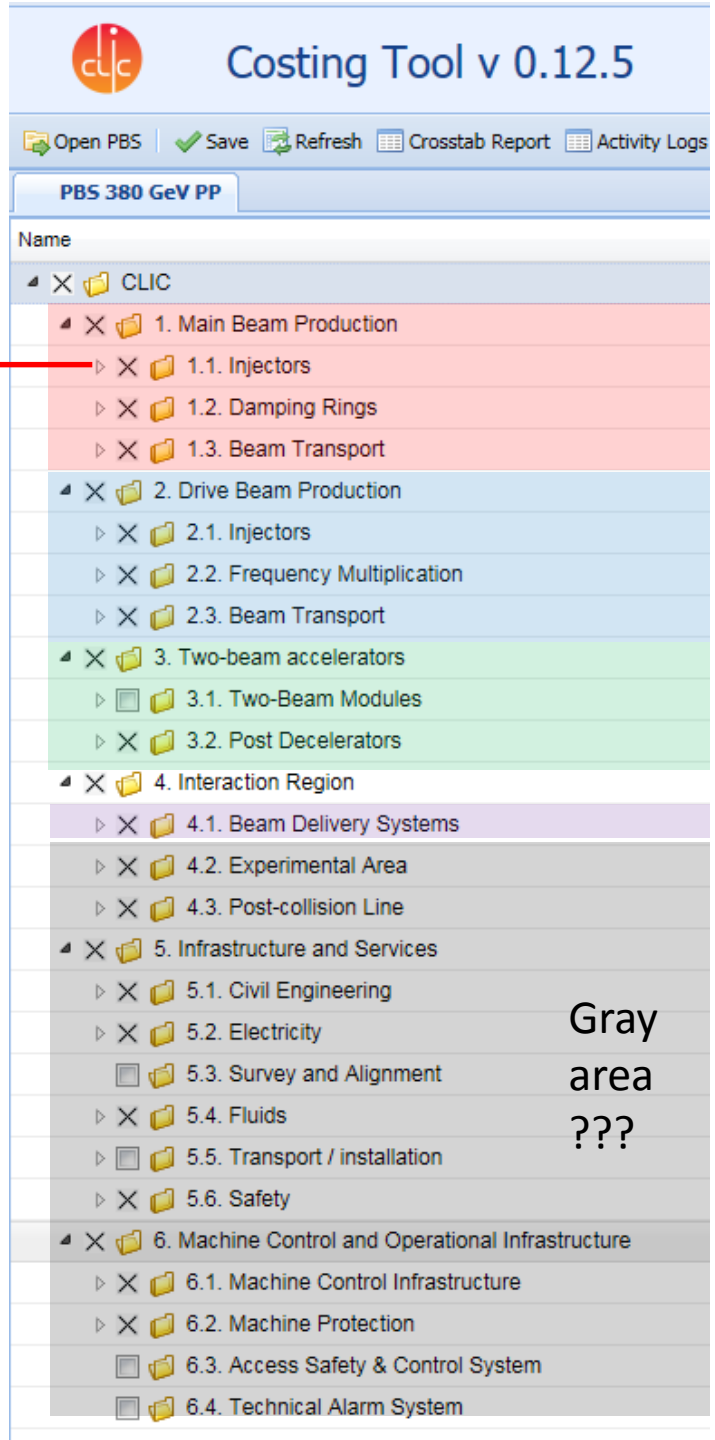


Completeness: lower level(s)

On the lower level(s), one have to check if all the items from CLIC cost PBS are included in Power model

And what is actually included for each item



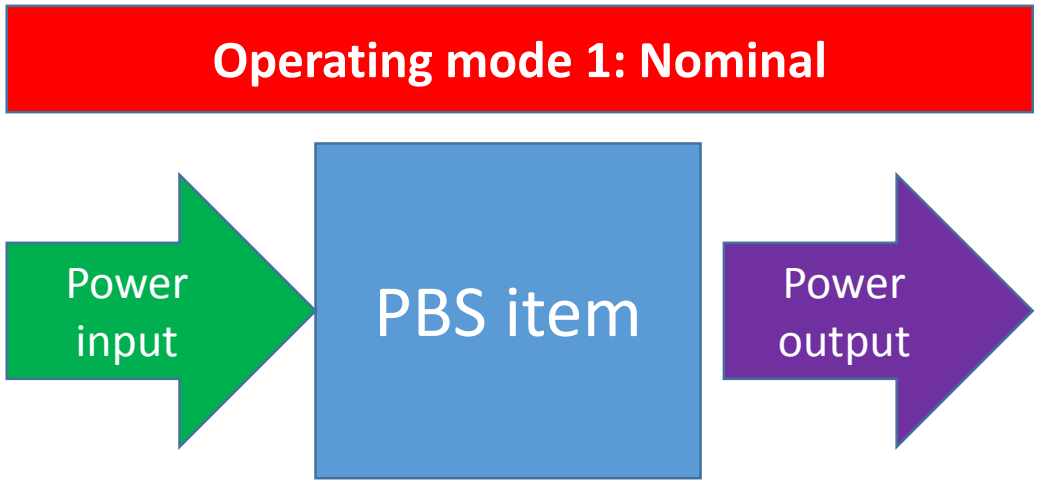


Gray area ???

Consistency

- Use Costing tool PBS for power estimate. This way, the power estimate as complete as the Cost PBS
- **Furthermore**, for consistency integrate power estimate into the Costing tool
  - This will provide consistency (single PBS, the changes are “automatically” propagated to power)
  - In addition, Operation cost can be estimated in the Costing tool
- We are looking into the possibility to integrate power consumption into the costing tool.

How it may look like: power parameter box



- **For each PBS item in addition to cost there will be a box with the following parameters**
- **There will/may be several boxes each corresponding to different operating mode:**
  - **Nominal**
  - **Stand by (waiting for the beam)**
  - **Stop**
- **For a given operating mode box the operating mode parameters (accelerating gradient, beam current(s), etc) are the same for all PBS items**

How it may look like: power calculator

- Operating mode 1 x number of day per year = MODE 1 MWh
- Operating mode 2 x number of day per year = MODE 2 MWh
- Operating mode 3 x number of day per year = MODE 3 MWh
- …..
- ==========
- Total = total MWh per year

Work in progress

- Power box implementation
- How many operating modes ?
- Can number of modes be dynamic or only static ?
- Connections between different PBS items in terms of power to be defined
- …
- How fast this can be implemented in Costing tool ?

Summary and outlook

- The work on updating power consumption for CLIC is in progress
- The main focus is the CLIC 380 GeV two beam baseline
- Then, it can/will be extended to second and the third stages as well as to the klystron-based CLIC
- Cost PBS will be used to ensure completeness of the inventory of the items
- Feasibility of integration of power consumption into the Costing tool is under investigation together with Pablo and Benoit

P.S. :Feedback form Pablo and Benoit (30/11/2017)

- The changes we discussed together on Tuesday are not trivial to implement on our side.
- Given that you need these changes ready in less 3 months from now, we think it is not realistic on our side to be able to deliver these changes on time.
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- Therefore, what we recommend is that:
- You download the PBS to an Excel file from the Costing tool.
- You start entering the data you're collecting from the domain experts in your Excel file.
- If needed, we can implement a custom report listing all the changes applied to the PBS between 2 dates.
  This way, you'll be able to add missing nodes to your Excel file, add extra nodes, etc. and make sure you're staying synchronized with the official PBS.