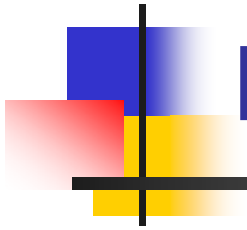


Powering procedures

W. Venturini Delsolaro

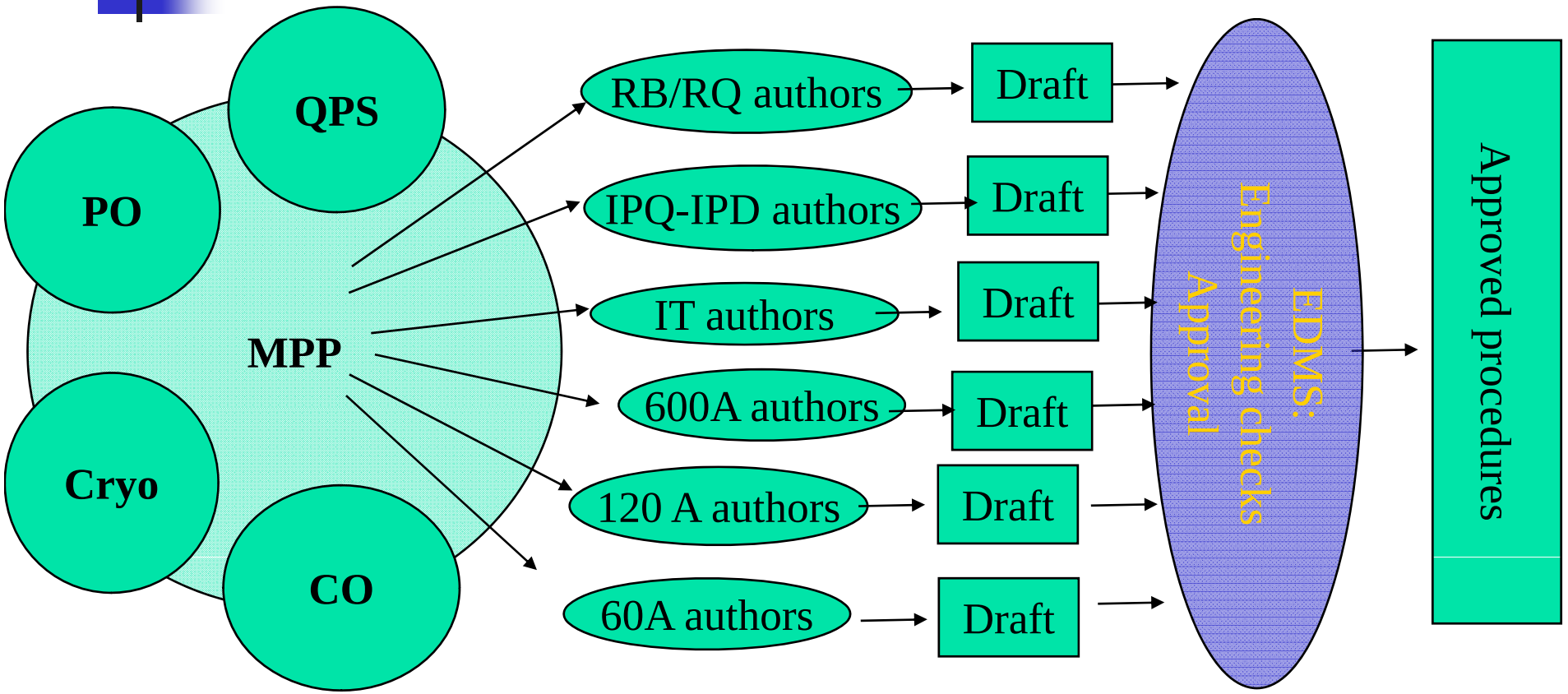
With inputs from many colleagues

Hardware commissioning day, 19/3/2009

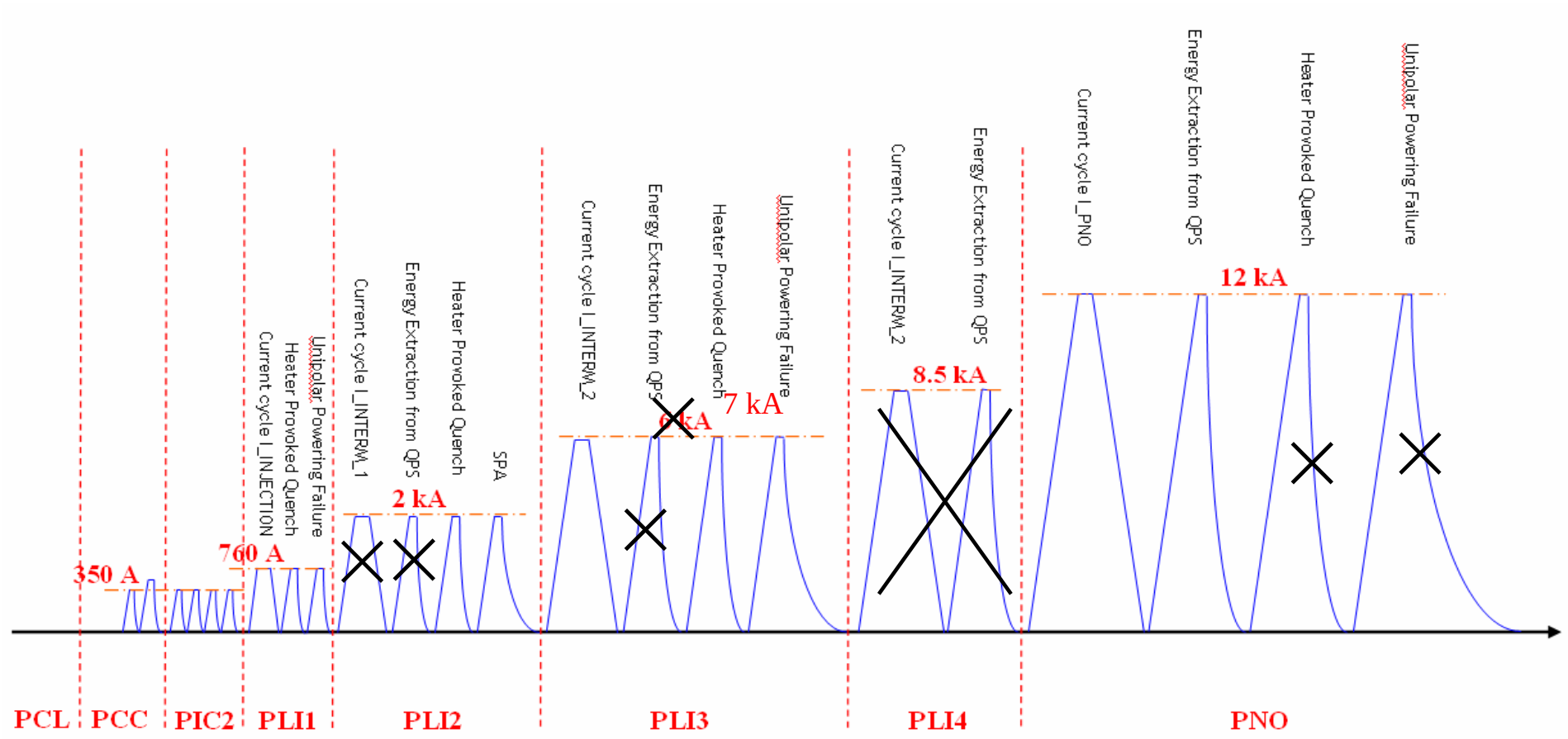
Outline

- Powering procedures in 2007-2008
- Procedures for 2009, needs, issues
- Present status of powering procedures

Procedures work organization in 2007-08, in the frame of the Hardware Commissioning Coordination



Procedures reviewed after 7-8 and 4-5 commissioning, example of the RB circuit



Today:

- Clear need to review/update procedures:
  - Sectors (circuits) have different hystories (see Reyes' talk)
  - New equipment (QPS) to be commissioned
  - New measurement methods available (snapshots, calorimetry)
  - PGC step to be reviewed
  - MTF properties and NC tracking to be reviewed
- All this must be integrated in a single procedure describing **all** tests done after IST are finished.
- To produce new versions of the edms documents, work has started within the "nMPP" (see next slide)
- Minimise impact on software, even though a few sequences will have to be added

- Working list of procedures with associated editors and equipement experts; engineering check lists are open

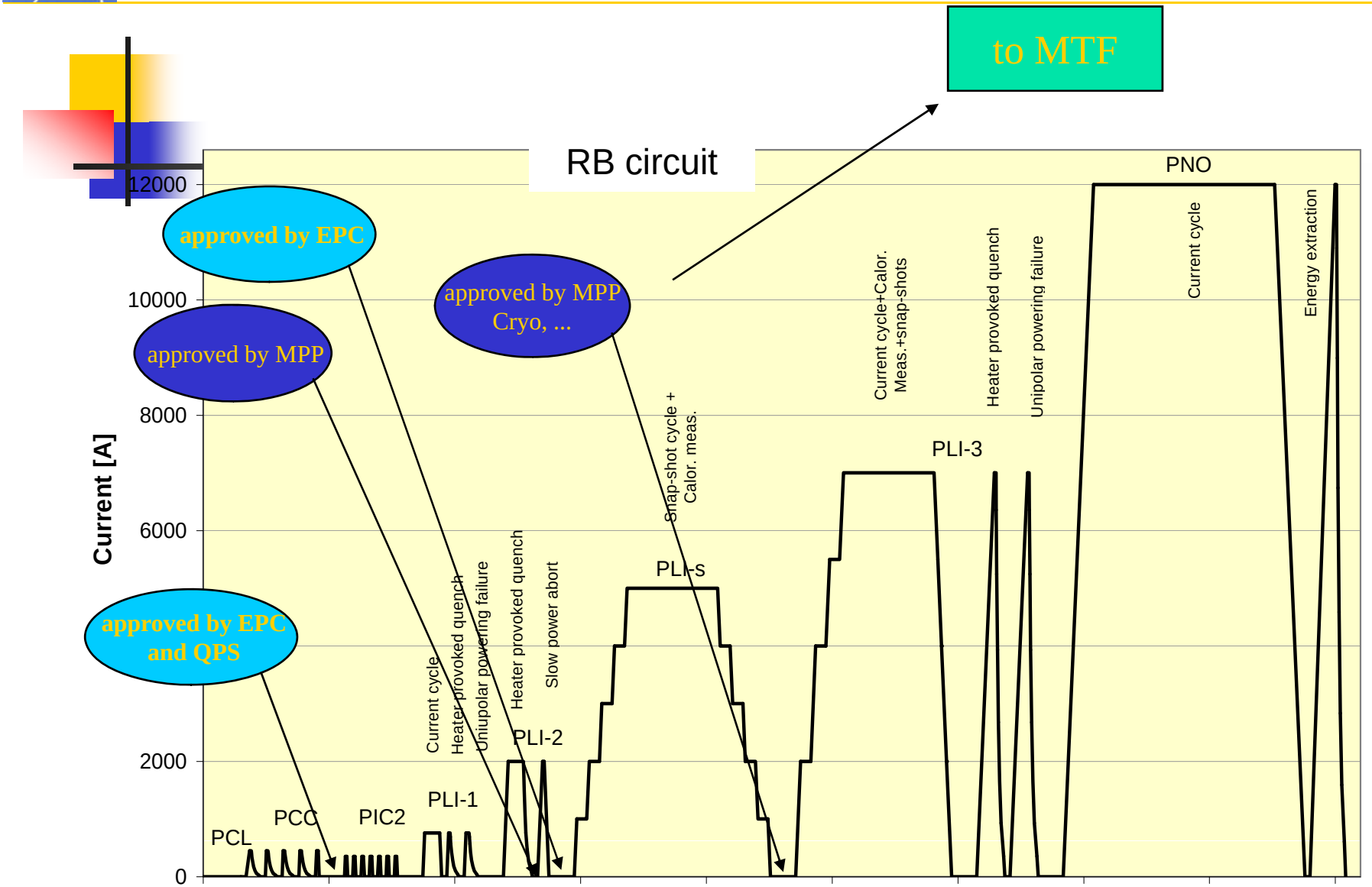
N?	Powering Procedure Title	EDMS n. / STATUS	Editors	Equipment experts
1	Test procedure and acceptance criteria for the **13 kA dipole circuits**	**874713** **Released**	A.Verwej M.Pojer M.Solfaroli	V.Montabonnet / H.Thiesen M.Zerlauth K.Dahlerup-Petersen / R.Denz A.Ballarino
2	Test procedure and acceptance criteria for the **13 kA quadrupole (RQD-RQF) circuits**	**874714** **Released**	A.Verwej M.Pojer M.Solfaroli	V.Montabonnet M.Zerlauth K.Dahlerup-Petersen / R.Denz A.Ballarino
3	Test procedure and acceptance criteria for the **600 A circuits**	**874716** **Released**	W.Venturini Delsolaro B.Bellesia M.Pojer	V.Montabonnet M.Zerlauth R.Denz G.J.Coelingh A.Ballarino
4	Test procedure and acceptance criteria for the **80 A and 120 A dipole corrector circuits**	**874722** **Released**	G.D'Angelo A.Vergara M.Solfaroli	D.Nisbet M.Zerlauth A.Ballarino
5	Test procedure and acceptance criteria for the **60 A corrector circuits**	**874724** **Released**	G.D'Angelo A. Vergara M. Solfaroli	D.Nisbet M.Zerlauth A.Ballarino
6	Test procedure for the individually powered **4-6 kA Quadrupole-circuits** in the LHC insertion	**874884** **Approval Closed**	N.Catalan Lasheras G.Kirby A.Vergara B.Bellesia	D.Nisbet M.Zerlauth R.Denz / S. le Naour A.Ballarino
7	Test procedure and acceptance criteria for the **separation dipoles circuits**	**874885** **Approval Closed**	G.Kirby N.Catalan Lasheras A.Vergara B.Bellesia	D.Nisbet M.Zerlauth R.Denz / S. Feher A.Ballarino
8	Test procedure and acceptance criteria for the **Inner Triplet circuits**	**874886** **Eng. Check Closed**	N.Catalan Lasheras G.Kirby A.Vergara M.Pojer	H.Thiesen / J.Thomsen M.Zerlauth R.Denz / S. Feher A.Ballarino
9	Test procedure and acceptance criteria for the **Powering of Group of Circuits**	**916266** **Eng. Check Closed**	G.Arduini R.Wolf B.Bellesia M.Solfaroli	V.Montabonnet / H.Thiesen M.Zerlauth K.Dahlerup-Petersen R.Denz G.J.Coelingh A.Ballarino

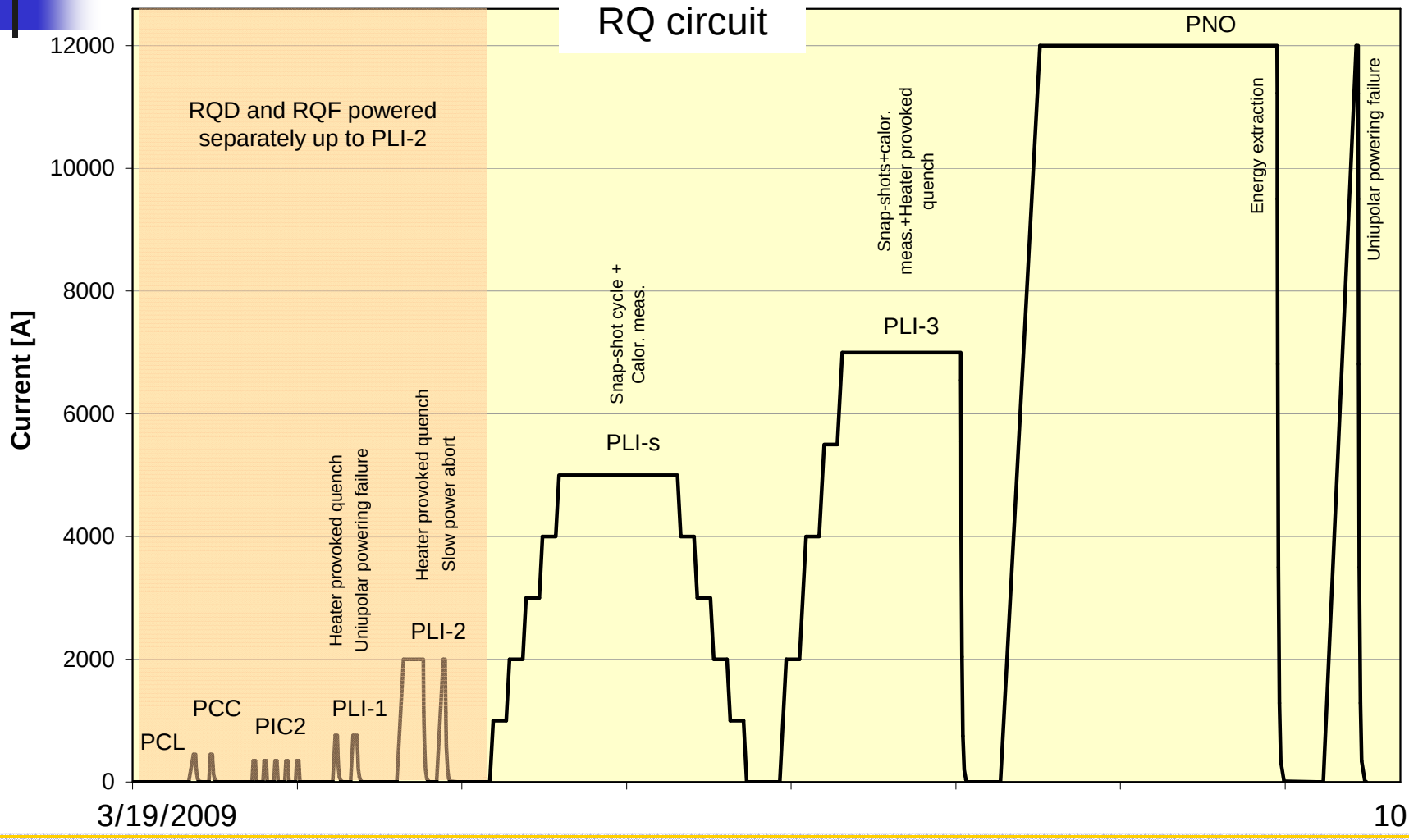
How to take into account the different history of each sector (circuit)?

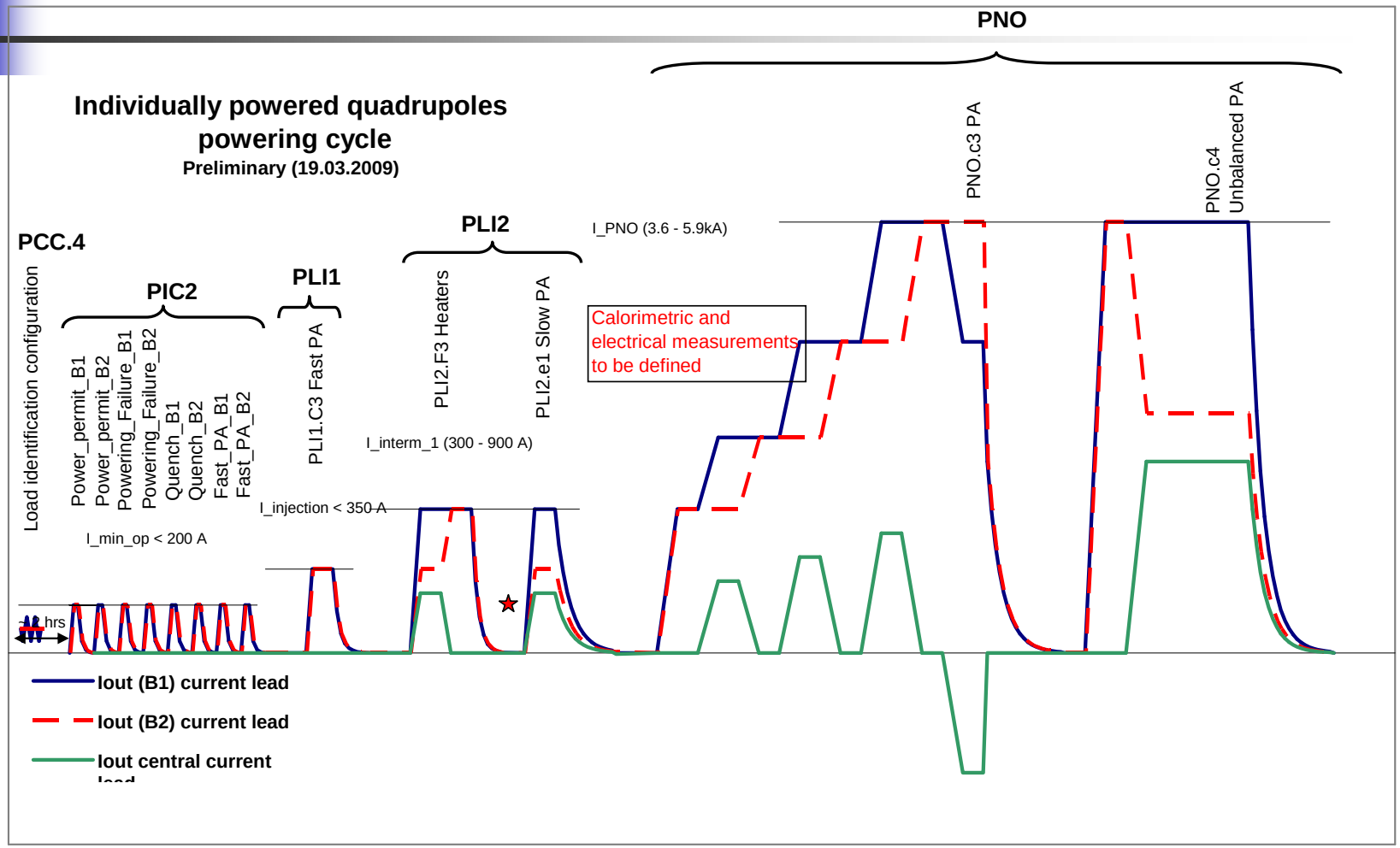
- The status of all circuits was documented in edms by the point owners
- Most circuits were commissioned to 7 TeV, with many exceptions
- Past approach: 1 general document per circuit type + 8 sector specific documents
- For future, a general matrix trying to relate steps to be repeated to the changes occured is under discussion

Present orientation of the teams for 2009 commissioning

- Sector 3-4 treated as a completely new sector
- RB and RQs fully recommissioned in all sectors with new procedures
- IPQs: Interlocks + electrical meas of R + Calorimetry
- IT?
- 600 A: in general PIC, PCC and PNO, with exceptions (DC contactor, a few new L(i), achieve nominal param.)
- 60-80-120 A: fully recommissioned, in parallel and in automatised way (after an ECR changed nominal ramp rate)

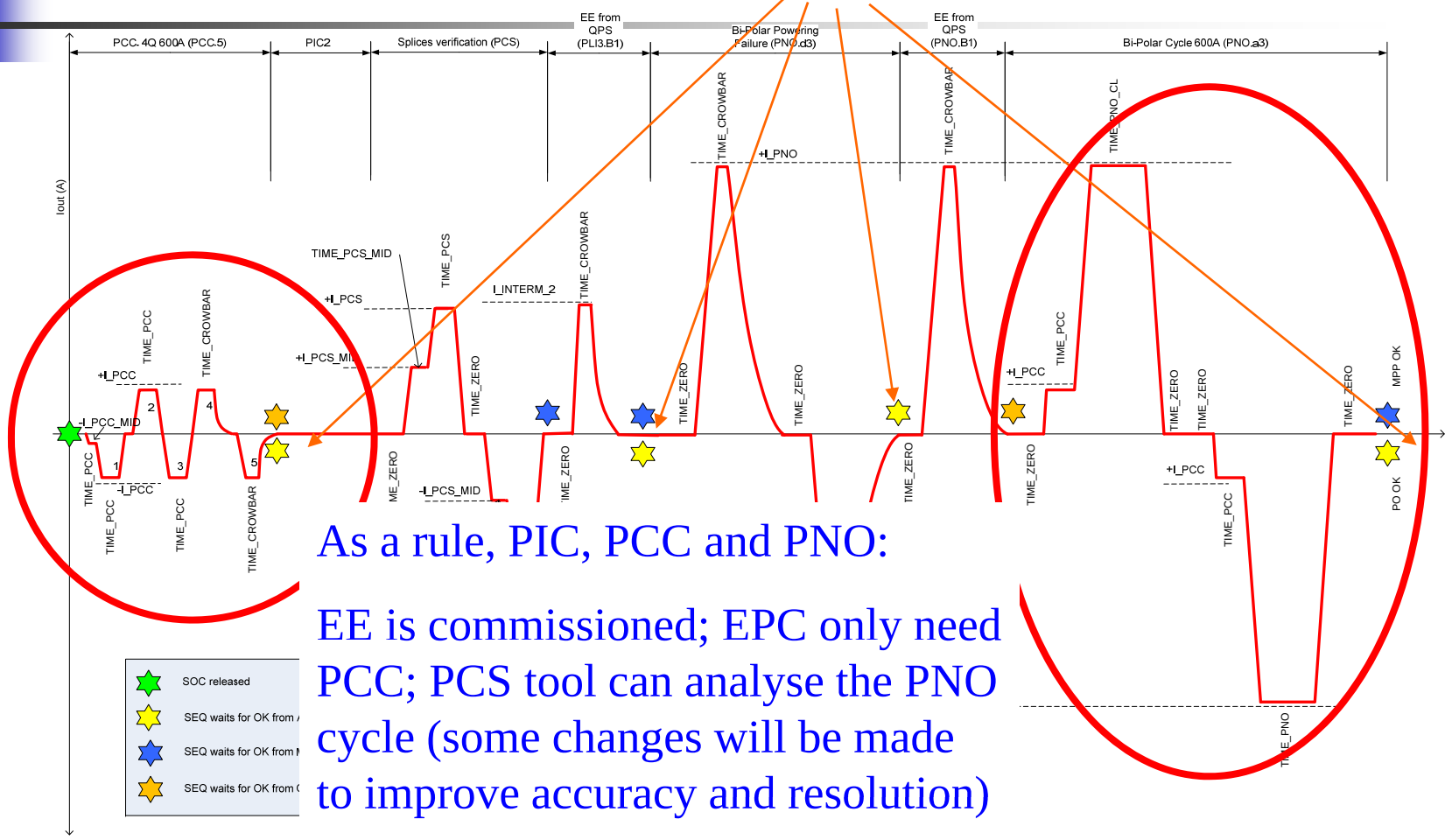

to MTF
RB circuit
12000
10000
8000
6000
2000
0
Current [A]
approved by EPC
approved by MPP
Cryo, ...
approved by MPP
approved by EPC
and QPS
PCL
PCC
PIC2
PLI-1
PLI-2
PLI-s
PLI-3
PNO
Current cycle
Heater provoked quench
Uniupolar powering failure
Heater provoked quench
Slow power abort
Snap-shot cycle +
Calor. meas.
Current cycle+Calor.
Meas.+snap-shots
Heater provoked quench
Unipolar powering failure
Current cycle
Energy extraction


RQ circuit
RQD and RQF powered separately up to PLI-2
Current [A]
12000
10000
8000
6000
4000
2000
0
PCL
PCC
PIC2
PLI-1
Heater provoked quench
Uniupolar powering failure
PLI-2
Heater provoked quench
Slow power abort
Snap-shot cycle + Calor. meas.
PLI-s
PLI-3
Snap-shots+calor. meas.+Heater provoked quench
PNO
Energy extraction
Uniupolar powering failure
3/19/2009
10


Individually powered quadrupoles
powering cycle
Preliminary (19.03.2009)
PCC.4
Load identification configuration
PIC2
Power_permit_B1
Power_permit_B2
Powering_Failure_B1
Powering_Failure_B2
Quench_B1
Quench_B2
Fast_PA_B1
Fast_PA_B2
PLI1
PLI1.C3 Fast PA
PLI2
PLI2.F3 Heaters
PLI2.e1 Slow PA
PNO
PNO.c3 PA
PNO.c4
Unbalanced PA
I_PNO (3.6 - 5.9kA)
Calorimetric and
electrical measurements
to be defined
I_interm_1 (300 - 900 A)
I_injection < 350 A
I_min_op < 200 A
hrs
Iout (B1) current lead
Iout (B2) current lead
Iout central current

600 A circuits

For 16 circuits (DC contactor) → repeat all steps approved by EPC



As a rule, PIC, PCC and PNO:

EE is commissioned; EPC only need PCC; PCS tool can analyse the PNO cycle (some changes will be made to improve accuracy and resolution)

Conclusions

- New versions of the powering procedures are under work: teams are formed and will produce drafts in the next few weeks
- The resulting test plans will be implemented in the sequencer and used in the CCC during the whole HC phase
- Therefore it is important that we get the feedback of everybody involved
- Matteo is the contact person for the EDMS routing (Engineering check lists)
- Any technical questions or issues can be as well submitted to the nMPP meeting (contact Nuria, Rudiger, or Walter)