Main MPE Activities during YETS/EYETS/LS2 and the Provision of Resources

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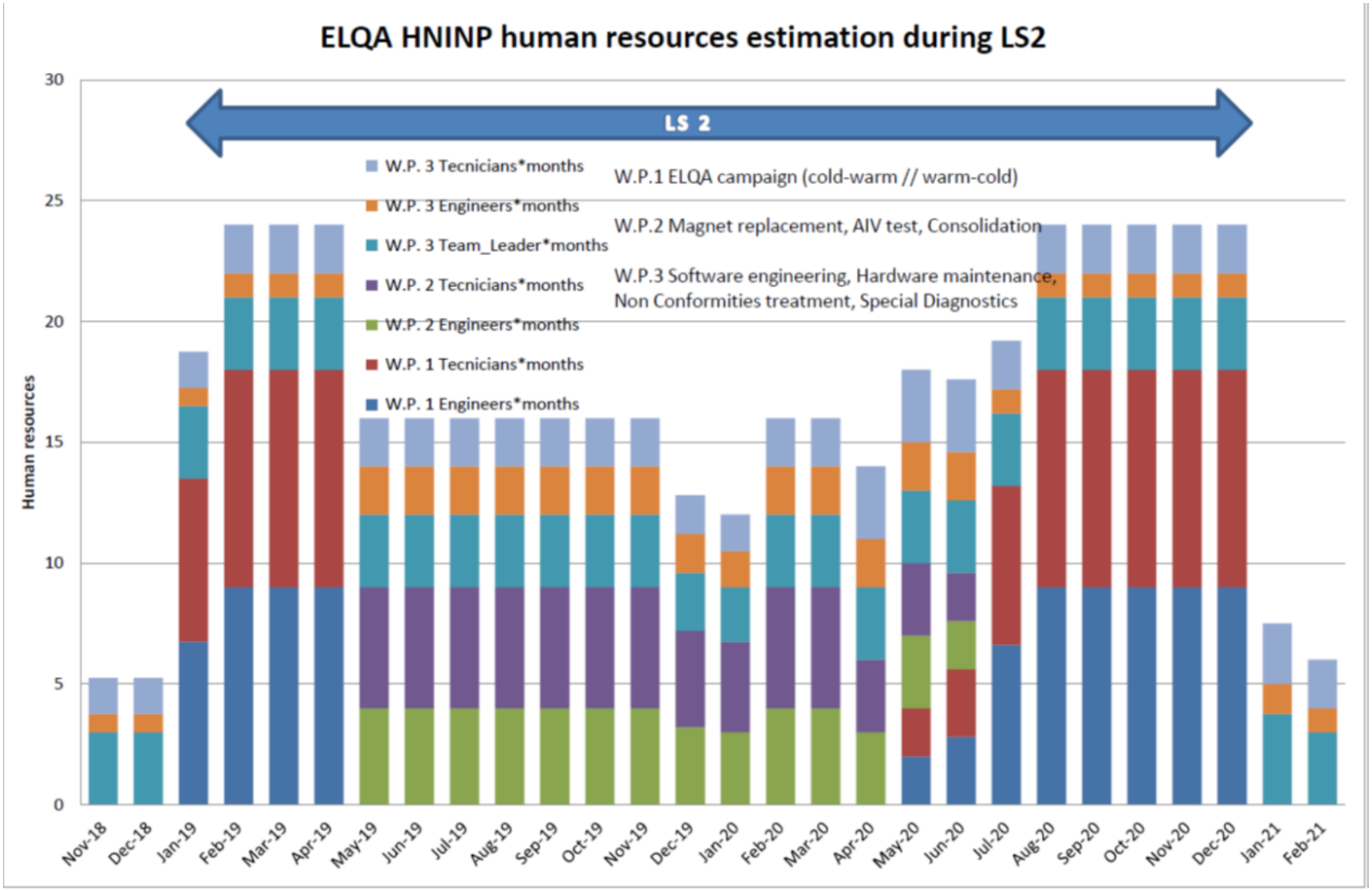
Outline

- ELQA during LS2
  - AVAILABLE MANPOWER VS QUANTITY OF WORK DURING LS2
- Upgrade of DQYPQ “Quadrupole Yellow Racks”
- Upgrade of QPS systems
- Maintenance of Energy Extraction Systems
  - 13 kA EE
  - 600 A EE
- Deployment of WIC interlocks in PS
- LHC magnet circuit re-commissioning, including powering tests

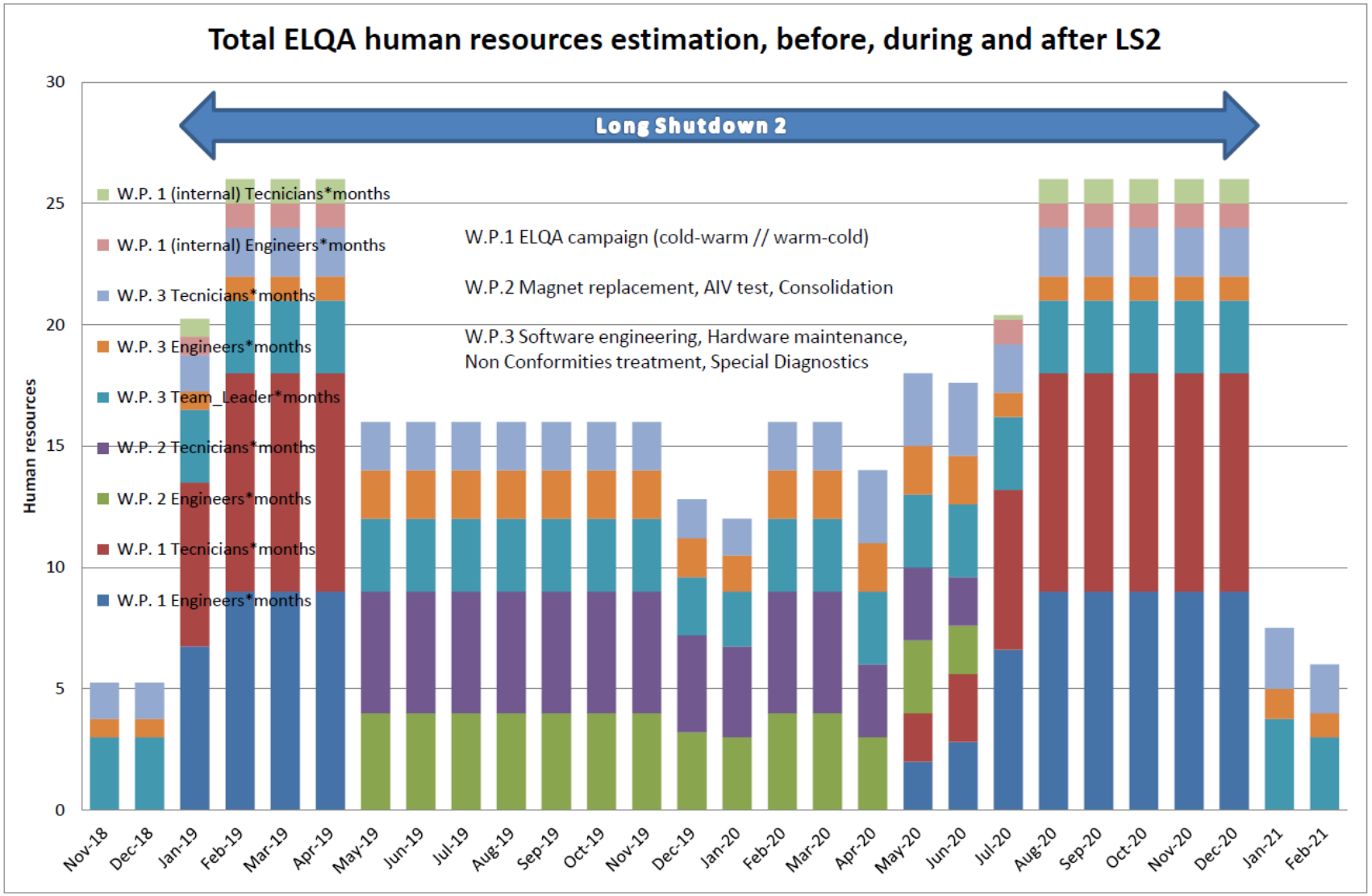
Scenario assumed for ELQA activities during LS2

- - ELQA campaign at cold before warm up of magnets for LS2 activities
- - ELQA campaign at warm before start of LS2 activities
- - ELQA (AIV, MIC & DOC) for 5 to 10 magnets to be replaced and NC diagnostics
- - ELQA campaign at warm before cool down after LS2
- - Final ELQA campaign at cold before powering tests

ELQA during LS2 – external resources



ELQA during LS2 – required resources (total)



ELQA – external resources

- Three contacts with HNINP, Cracow for upgrading the ELQA test systems for LS2 are signed and running
- One additional contract with the same Institute for assistance during TS, YETS and EYETS is signed and also operational
- Contracts for the resources for LS2 ELQA activities are not yet signed, but preliminarily agreed with HNINP
  - Total cost nearing 3 MCHF

Upgrade of DQYPQ “Quadrupole Yellow Racks”

- Similar to DQYPB “Dipole Yellow Racs” performed during LS1.

- “HL-LHC ready” principle (i.e. no more changes required for covering the future needs)
- It concerns less equipment (396 units instead of 1232), but the required expert level resources are similar
- Includes replacement of the existing version of the QDS detection crate by a new - including next generation detection systems, enhanced quench heater supervision, fully redundant powering and advanced options for crate supervision and maintenance.
- Includes DQHDS pulse current measurement transformers and a re-designed electrical shuffling module (DQLIM).
- Similar number of contracts with industry as the DYPB upgrade of LS1.

Quench Protection Upgrades

- IPQ, IPD & IT protection
  - Upgrade of IPQ, IPD and IT systems to dedicated bus-bar splice protection and diagnostics, add enhanced quench heater circuits supervision, improve DQHDS trigger, elaborate a safe remote power cycle option.
- 600 A protection DAQ & current sensors
  - Upgrade of DAQ systems and crate supervision. Possible upgrade of current sensors for measuring directly the derivative of the current.
- HiLumi 11 T magnets
  - Deployment detection and supervision systems for the new 11T magnets, including a revised bus-bar protection.
- Monitoring and protection of conical joints
  - Installation of new detection electronics to monitor the resistance of conical joints used in the warm cabling of the LHC main circuits

Maintenance of Energy Extraction Systems

- 13 kA EE systems
  - Extensive maintenance campaign, similar to LS1
  - External resources are mandatory – contracts are not yet established, but underway

- 600 A EE systems
  - To some degree a less extensive maintenance campaign as compare to LS1
  - External resources are nevertheless mandatory – contracts are not yet established

Magnet Interlock consolidation in PS complex

- MPE is committed to continue deployment of generic, COTS based Warm Magnet Interlock System (WIC)
  - >33 instances already deployed in LHC, TI2, TI8, SPS, AWAKE, HighRadMat, TT10/20, PSB, LINAC4, HIE-ISOLDE, LINAC3 and LEIR
- 3 families of legacy interlock systems still remain today (PS, North Area + AD/TT2/East Area/…)

- Aiming for coherent consolidation plans in-line with EPC and MSC
  - complete main proton chain by end of LS2 (including PS, L4-PSB-PS transfer lines, TT2/nTOF/TT10, East Area?)
  - remaining EXP areas by LS3 (AD, North Area, BA80)
  - Detailed discussions ongoing in view of EYETS and LS2 activities

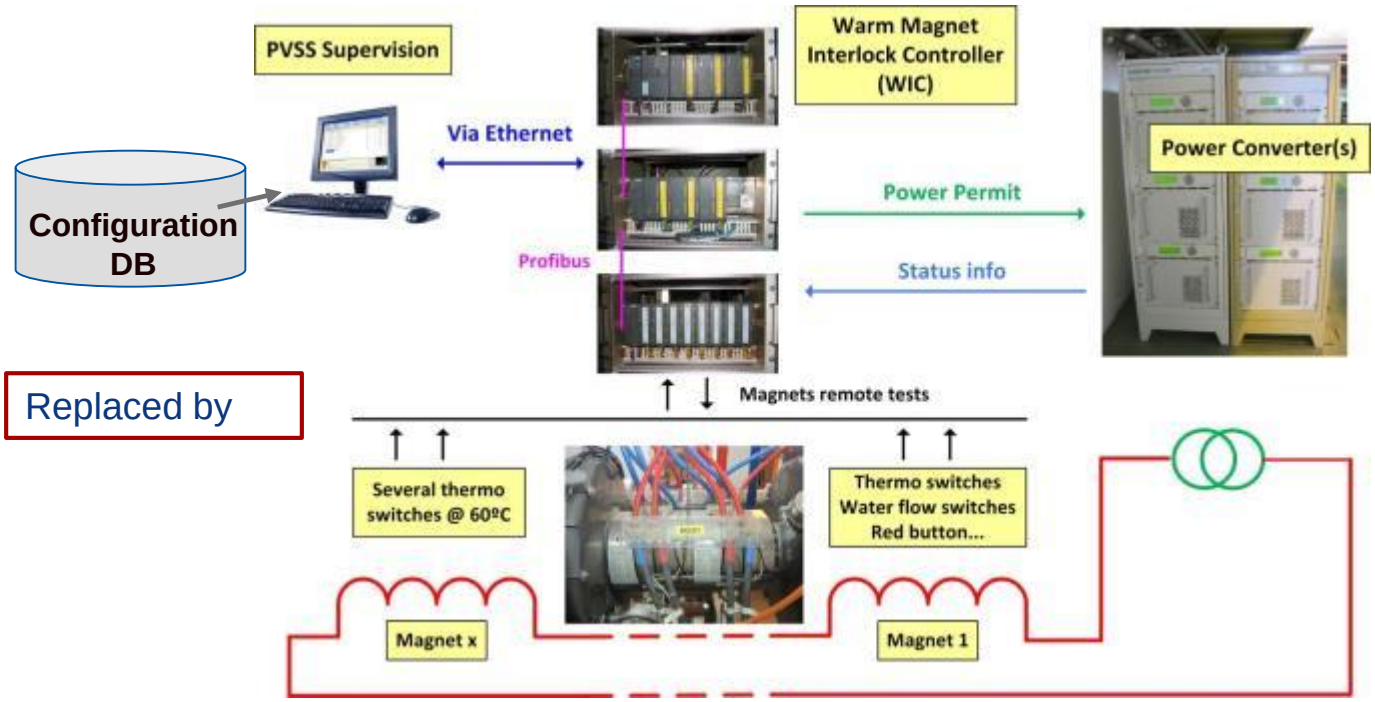
Magnet Interlock consolidation in PS complex (contd.)
WIC installation – generic solution

Standardized interlock system for normal conducting magnets based on Programmable Logic Controllers (PLC):

- Collects inputs from thermo-switches, flow switches and internal PC faults
- Provides Permits to the power converter and beam interlock system

Legacy magnet interlocks for PS mains and auxiliaries

Replaced by



LHC magnet circuit re-commissioning, including powering tests

- Similar campaign to LS1
  - Will require external expert level resources with experience from previous LHC campaigns
  - At present it is much less evident to find such resources