



# HL-LHC Procurement Status and Quality Report

Hector Garcia Gavela, Victor Guillen Humbria, Gorana Prica,  
Lorcan Quain Solis

HL-LHC Procurement, Documentation, Quality and Risk Office

*13<sup>th</sup> HL-LHC Collaboration Meeting, Vancouver – September 25<sup>th</sup> to 28<sup>th</sup> 2023*

# Outline

1. Procurement Overview
2. Status 2023
3. Upcoming procurement
4. Quality
5. Summary

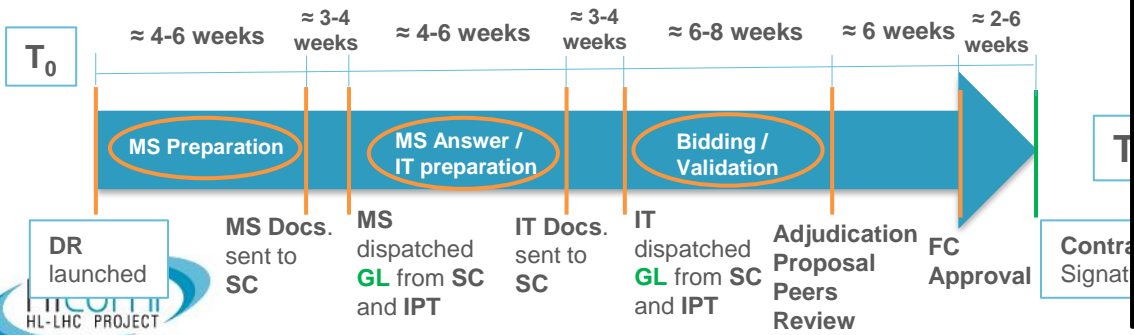
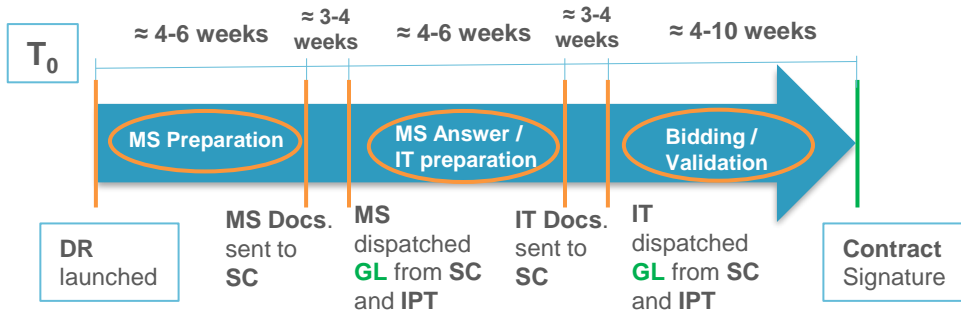
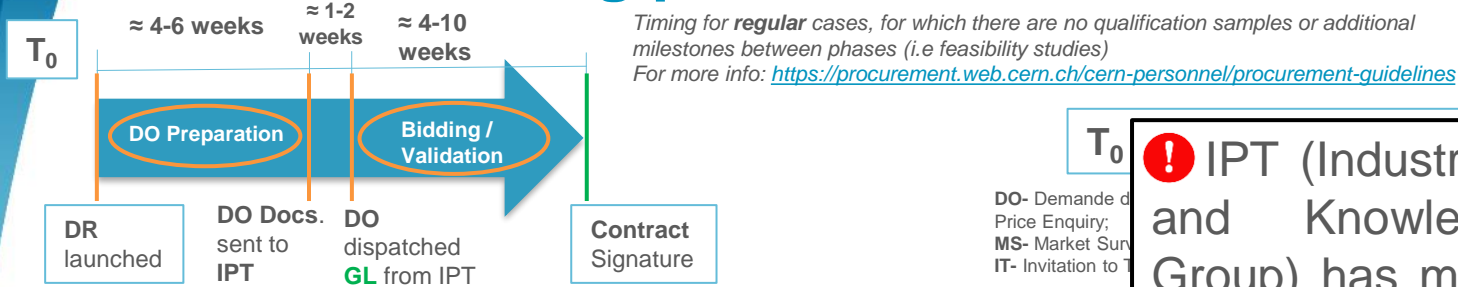
# Outline

- 1. Procurement Overview**
2. Status 2023
3. Upcoming procurement
4. Quality
5. Summary

# Overview HL-LHC Procurement 2023

- As **announced** in **CSR'21** and **CSR'22**, **2023-2024** was foreseen as **very intense period** for HL-LHC procurement. This has been **fully confirmed** during the (**still on-going**) activity in **2023**
- Extra efforts have been made to **ensure** there are **no delays** in launching the **processes or awarding the Contracts** (always in line with CERN Procurement Rules). This has been our **primary goal** since the **beginning of the Project**
- **Margins** are **shorter** wrt readiness-for-installation dates. **Delays or issues** in the **procurement phase (tendering and/or production)** might have a **non-recoverable impact**
- **Mitigation actions** put in place after **discussion and agreement** with IPT
- **Significant changes** in two of the main stakeholders for procurement activities in 2023, including the main interfaces with the Project (**New IPT management** and **Group Structure**, and **SC Lead Chairperson** has been replaced). **Very smooth transition** and the **long fruitful cooperation is kept (Thanks!)**

# Tendering processes and timeline

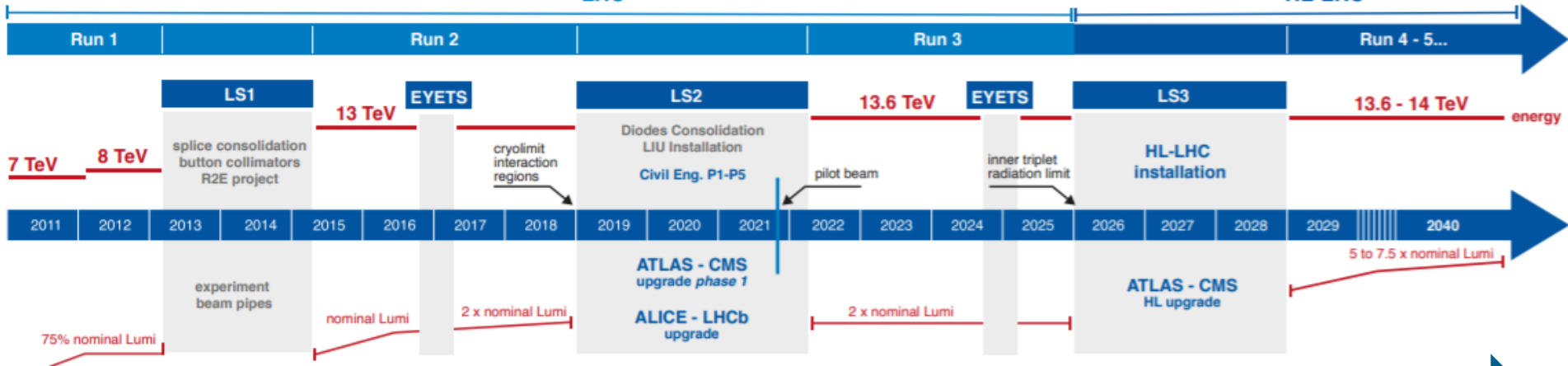


**!** IPT (Industry, Procurement and Knowledge Transfer Group) has made a proposal to Council to increase the historic thresholds (since 1970's) required for MS and FC approval. Decision should be known in one of the upcoming Council meetings. HL-LHC will not take fully advantage (very much advanced), but it will still help to speed-up some cases and reduce the workload

# HL-LHC Procurement

LHC

HL-LHC



**MOCK-UPS / SHORT MODELS / PROTOTYPES**    **LS2 / CE / LONG LEAD ITEMS RAW MATERIALS / MECHANICS**    **ELECTROMECHANICS SERVICES / IT STRING**    **ELECTRONICS TRANSPORT**    



# Outline

1. Procurement Overview
2. **Status 2023**
3. Upcoming procurement
4. Quality
5. Summary

# Procurement & Risk (update in 2023)

- **Market situation still challenging** for raw materials and electronics:
  - **Vendors guarantee prices for few weeks only – uncertainty reflected in largely increased margins for bids** - *This is still the case and confirmed in the tendering processes despite the market is less volatile nowadays*
  - **Suppliers decline participation to Market Surveys or Tenders, limiting options and reducing competition** - *This is (unfortunately) still the case (and a kind of worrying trend)*
  - **Current and projected workload preventing firms to engage in new contracts – reduced competition** - *This is (unfortunately) still the case*
  - **Energy and oil prices remain high – manufacturing and transportation costs highly impacted** - *This is still the case and energy indexes are still increasing*
  - **Limited availability of many conventional components – Long lead times lead to schedule risk** – *Situation has improved but still far from being ideal*
  - **Claims from Contractors due to market situation: proposed to apply price revision formulas more often or some compensation if these formulas are not included in Contracts**  
*This is the case and fully confirmed this year*
- **Important orders have been awarded this year.** Several tenders are still on-going (see next slides)
- **Rather positive results so far (results to be presented at CSR'23).** Adequate resources for preparation and technical/commercial follow-up of procurement between HL-LHC project and IPT are vital to contain cost & risk exposure



# Main Supply Contracts for HL-LHC in 2023 (up to Sep'23)

| WP   | Contract                                       | Final Delta | Remarks   |
|------|--|-------------|---|
| 7    | Energy Extraction Systems                      |             | Same supplier as prototypes and IT String units allowed reducing the number of tests and decreasing the total price – FC Approval in October                                |
| 17.2 | Water cooled Cables (EN/EL FW Contract)        |             | Final cost will depend on the Cu price at the time of sending the release orders due to the Price Revision Formula  |
| 9    | GHe Storage Tanks                              |             | 2x80 m3 vessels will be refurbished so final price (4x250 m3+ 2x80 m3) in line with estimation  |
| 7    | Quench Heater Power Supplies                   |             | In-kind Contribution from Japan. Cost neutral for the Project   |
| 9    | Subcooling heat exchangers                     |             | Historic supplier for this equipment (LHC times) that will be supplying these components for HL-LHC   |
| 17.2 | Electrical Erection Works for Substation in P5 |             | Some extra cost due mainly driven by the installation costs   |
| 6B   | Measurement & controls - DCCT Class 2          |             | As for class 0, ceiling price from the phase 1 was increased for phase 2 (less savings than initially foreseen)   |
| 5    | Roller Screws for LS3 Collimators              |             | Very good outcome for this critical components for collimators  |
| 17.2 | Civil Engineering Works Harmonic Filters       |             |   |
| 15   | Customized Forklift                            |             | Some slight overcost (final offer more expensive than preliminary offline offers as the equipment has additional features that were not foreseen)                           |
| 5    | Inermet for LS3 Collimators                    |             | Cost increase due to energy price mainly (production cost more expensive)   |
| 4    | DQW Cryomodule 1 - Vacuum Vessel               |             | Despite the cost reduction in material (we allow using a less demanding SS grade), the cost of production has significantly increased since 2021 (production for RFD proto) |
| 3    | Bellows for IT String                          |             | Additional cost due the testing and material requested  |
| 5    | FPGA Xilinx XCZU7CG-1FFVF1517E                 |             | Good outcome despite the electronics market situation   |
| 7    | DQLCT  |             | To be reimbursed by Japan as part of the in-kind Contribution   |
| 5    | Bellows for LS3 Collimators                    |             | Very good outcome for this critical components for collimators  |
| 6B   | DCCT Class 3                                   |             | Single Source due to standardization needs  |
| 5    | Graphite for LS3 Collimators                   |             | Cost mitigation action proposed by WP5 (MoGr replaced by Cu-coated Graphite)  |
| 5    | BPM Ti buttons for LS3 Collimators             |             | None of the two MS firms delivered compliant samples. Purchased in JP to the LS2 producer   |

|                                       |   |
|---------------------------------------|---|
| <span style="color: green;">■</span>  | Adjudication price below the estimation                     |
| <span style="color: orange;">■</span> | Adjudication price above the estimation - Moderate overhead |
| <span style="color: red;">■</span>    | Adjudication price above the estimation - High overhead     |

# Procurement in 2023

| 2023  |  |  |   |  |   |  |   |  |   |  |  |
|---|--|--|---|--|---|--|---|--|---|--|--|
| January                                     | February   | March  | April   | May  | June  | July                                       | August  | September  | October   | November                                       | December   |
| IT-4513 (2nd Phase) (WP6B)<br>DCCTs Class 2 | DO-33742 (WP3)<br>MQXFB Coil components                | DO-XXXXX (WP9)<br>LN2 Storage Tanks                  | DO-33714 (WP5)<br>Edge Welded Bellows             | DO-33814 (WP7) -<br>DQCLTs Current Transformers          | DO-XXXXX (WP12)<br>Bake-out consum. & equip.        | DO-XXXXX (WP12)<br>Remote Handling tooling | DO-XXXXX (WP6B)<br>Cooling Plates for CDBs/WCBBs          | DO-XXXXX (WP5)<br>Bakeout jackets for LS3 Collimators    | DO-XXXXX (WP6B)<br>CDB Assembly                       | DO-XXXXX (WP14)<br>TCDS Blocks                 | DO-XXXXX (WP13)<br>RF Feedthroughs                 |
| MS-4839 (WP9)<br>Subcooling heat exchangers | DO-33733 (WP4)<br>DQW Vacuum Vessel                    | DO-33783 (WP9)<br>Quench Valves                      | DO-33731/30 (WP3)<br>Components for CP1 & CP2 CMs | DO-XXXXX (WP13)<br>BPM Button Electrodes                 | DO-33883 (WP15.4)<br>WPS sensors for IT String      | DO-XXXXX (WP12)<br>Supports & FRAS         | DO-33903 (WP6A)<br>REBCO Tape Type II                     | MS-4927 (WP5)<br>CuCr1Zr for LS3 Collimators             | DO-XXXXX (WP5)<br>CuNi cooling pipes                  | MS-XXXX (WP5)<br>Production LS3 Masks          | DO-XXXXX (WP15)<br>Feedthroughs for CCs Monitoring |
| IT-4805 (WP15)<br>Customized Forklift       | IT-4808 (WP17.2)<br>Electrical Works Sub-Station in P5 | IT-4838 (WP7)<br>2kA / 600A Mech. Switches EE System | IT-4839 (WP9)<br>Subcooling heat exchangers       | MS-XXXX (WP6B)<br>600A Power Converters                  | DO-33812 (WP5)<br>DO-33873 (WP5)<br>Roller Screws   | MS-XXXX (WP18)<br>Crates                   | IT-4914 (WP6B)<br>18 kA Crowbar Modules                   | MS-4909 (WP5) UAP components                             | DO-XXXXX (WP15)<br>Targets for Cold Masses Monitoring | IT-XXXX (WP6B)<br>DCCTs Class 4                | DO-XXXXX (WP15)<br>Targets for CCs Monitoring      |
| IT-4802 (WP9)<br>GHe Storage Tanks          | MS-4854 (WP6B)<br>18 kA and 14 kA Power Modules        |  | MS-XXXX (WP9)<br>Interconnecting Piping           | MS-4813 (WP5/WP13)<br>SiO2 ext. cables                   | IT-4807 (WP17.2)<br>Transformer Subs in P5          | MS-4892 (WP8)<br>TAXN Absorber             | IT-4775 (WP17.1)<br>Vertical Cores Excavation             | IT-XXXX (WP6B)<br>600A Power Converters                  | IT-4811 (WP5)<br>Chains for flanges                   | IT-XXXX (WP8)<br>TAXN Absorber                 | DO-XXXXX (WP8)<br>Plug-in connectors               |
|   | MS-4775 (WP17.1)<br>Vertical Cores Excavation          |  | Single Tender (WP6B)<br>DCCTs Class 3             | IT-4855 (WP17.2)<br>Power Transformers EN/EL FW Contract | MS-XXXX (WP6B)<br>DCCTs Class 4                     | MS-4892 (WP8)<br>TAXS Absorber             | MS-4913 (WP6B)<br>R2E-HL-LHC 60-120 A PCs                 | IT-4722 (WP6A)<br>REBCO Tape                             | MS-4928 (WP5)<br>Supports/Cradles for Collimators     | IT-XXXX (WP8)<br>TAXS Absorber                 | DO-XXXXX (WP12)<br>EDPM Gaskets                    |
|   | Single Tender (WP9)<br>Control Valves                  |  | Single Tender (WP12)<br>Mini Racks                |  | IT-4854 (WP6B)<br>18 kA Power Modules               | MS-4904 (WP3)<br>Bellows for LHC magnets   | MS-4857/58 (WP14)<br>Material for TDE Dump Cores          | MS-4908 (WP3, WP4, WP8)<br>Jacks                         | IT-4913 (WP6B)<br>R2E-HL-LHC 60-120 A PCs             | IT-4813 (WP5/WP13)<br>SiO2 external cables     | DO-XXXXX (WP12)<br>Pumping Ports                   |
|   |  |  |   |  | IT-XXXX (WP9)<br>Interconnecting Piping             | MS-4811 (WP5)<br>Chains for flanges        | MS-XXXX (WP15)<br>Rad Hard LEDs HL only 10%               | Single Tender (WP5)<br>Guiding Shaft for LS3 Collimators | MS-XXXX (WP17.2)<br>Genset for P5                     | IT-4810 (WP5)<br>Production of LS3 Collimators | DO-XXXXX (WP5)<br>Tungsten alloy for LS3 masks     |
|   |  |  |   |  | Single Tender (WP5)<br>Graphite for LS3 Collimators | IT-4894 (WP6B)<br>Power Modules 14kA PCs   | Single Tender (WP5)<br>GLIDCOP for LS3 Collimators        | Single Tender (WP5)<br>Connectors for LS3 Collimators    |   | IT-XXXX (WP15)<br>Rad Hard LEDs HL only 10%    | IT-4904 (WP3)<br>Bellows for LHC magnets           |
|   |  |  |   |  |   |  | Single Tender (WP5)<br>Tungsten alloy for LS3 Collimators |  |   | MS-XXXX (WP17.2)<br>UPS FW Contract            | IT-4927 (WP5)<br>CuCr1Zr for LS3 Collimators       |
|   |  |  |   |  |   |  |   |  |   | IT-4908 (WP3, WP4, WP8)<br>Jacks               | IT-XXXX (WP17.2)<br>Genset for P5                  |

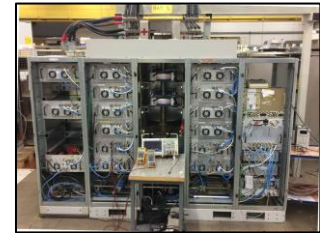
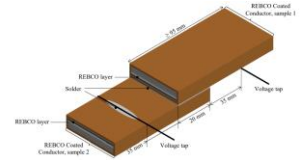
- Cost estimation [50 kCHF, 200 kCHF]
- Cost estimation [200 kCHF, 750 kCHF]
- Cost estimation > 750 kCHF
- Potential Non-competitive Tender

- Already dispatched
- Under preparation
- Under discussion
- Cancelled



# Mitigation actions in procurement (in agreement with IPT)

- **Single Tenders for urgent needs** while in parallel the official process is launched (i.e. Subcooling HEX, Bellows, etc). **Needs for 2024 are fully covered reducing the schedule risk**
- Agreed to **skip the Market Survey phase** due to the **proven limited market**, which **reduces the total duration of the tendering phase** (i.e. REBCO)
- Agreement to **amend existing Framework Contracts** to integrate **additional scope** from other Groups (i.e. Warm piping for WP9 via C&V Contractor), which reduces the **financial exposure and time for tendering**
- **Frame Market Survey** used for various cases (i.e. Power Converters, 1 MS used for up to 4 different ITs so far) **reducing the overhead in the technical and commercial side**
- **Procurement of critical components from CERN** (free-issued to Contractor), which allows better of control of components (**Quality**) and cost optimization
- **Prototyping (qualification samples) during MS to minimize technical risk** in the award of the Contract (i.e. LS3 Collimators, Materials for TDE Dump, SiO2 Cables), **Firms are qualified based on the quality of the products**
- **FC approval in some cases** despite the date to send the **adjudication proposal was overdue helping to reduce schedule risk** (i.e. EE Systems, Inermet for Collimators, Electrical works for P5 Substation)
- **Letter of Intent before FC approval to start working on design activities** or others **prior to final signature (Procurement Rules, this is always an available tool)**







# Outline

1. Procurement Overview
2. Status 2023
- 3. Upcoming procurement**
4. Quality
5. Summary

# Upcoming Procurement 2024

| 2024  |  |   |  |  |   |   |        |                            |  |                                     |          |
|---|--|---|--|--|---|---|--------|----------------------------|--|-------------------------------------|----------|
| January   | February   | March   | April  | May                                      | June  | July  | August | September                  | October                                  | November                            | December |
| DO-XXXX (WP4)<br>RF Lines - Straight 5m and elbow         | DO-XXXX (WP15)<br>Hydrostatic Levelling Sensors Series   | DO-XXXX (WP5)<br>FMC Cards for Motion Control | DO-XXXX (WP5)<br>HF Bellows for LS3 Collimators        | IT-XXXX (WP5)<br>Vacuum interconnects    | DO-XXXX (WP15)<br>Trailer for TAN, TAXN         | DO-XXXX (WP15)<br>Feedthroughs for CMs Monitoring |        | IT-XXXX (WP3)<br>W Bellows | IT-XXXX (WP4)<br>LLRF Faraday Cages      | DO-XXXX (WP8)<br>VAX Box assembly   |          |
| DO-XXXX (WP5)<br>Manifolds for LS3 Collimators            | MS-XXXX (WP13)<br>BLM Ionization Chamber                 | DO-XXXX (WP8)<br>Plug-in connectors           | IT-XXXX (WP15)<br>Wire Positioning Sensors Series      | IT-XXXX (WP13)<br>BGI Vacuum             | DO-XXXX (WP15)<br>Tractor for TAN, TAXN         | DO-XXXX (WP15)<br>Inclinometers                   |        |                            | IT-XXXX (WP5)<br>Stepping motors drivers | DO-XXXX (WP5)<br>PXI-e COMe Adapter |          |
| DO-XXXX (WP5)<br>Flexibles for LS3 Collimators            | MS-XXXX (WP5)<br>Stepping motors drivers                 | MS-XXXX (WP5)<br>PXIe Carrier                 | IT-XXXX (WP9)<br>Cryogenic Electrical Cabinets         | IT-XXXX (WP13)<br>BLM Ionization Chamber | DO-XXXX (WP15)<br>Transfer System for TAN, TAXN | IT-XXXX (WP6B)<br>DC Bus Bars                     |        |                            |  |                                     |          |
| IT-XXXX (WP5)<br>Production LS3 Masks                     | MS-XXXX (WP13)<br>BGI Vacuum                             | IT-XXXX (WP15)<br>ITMB for MAFI-like          | IT-XXXX (WP15)<br>Hydrostatic Levelling Sensors Series | MS-XXXX (WP3)<br>W Bellows               | IT-XXXX (WP15)<br>Unloading Equipment           | MS-XXXX (WP4)<br>LLRF Faraday Cages               |        |                            |  |                                     |          |
| IT-4928 (WP5)<br>Supports/Cradles for Collimators & masks | MS-XXXX (WP15)<br>Wire Positioning Sensors Series        | IT-XXXX (WP15)<br>Unloading Equipment         | IT-XXXX (WP6B)<br>18 kA DC-DC Modules                  |  | MS-XXXX (WP15)<br>ITMB for MAFI-like            |   |        |                            |  |                                     |          |
| MS-XXXX (WP5) Jigs and Jacks for UAP                      | MS-XXXX (WP6B)<br>DC Bus Bars                            | IT-XXXX (WP15)<br>Unloading Equipment         |  |  | IT-XXXX (WP15.4)<br>WPS Sensors                 |   |        |                            |  |                                     |          |
| MS-XXXX (WP6B)<br>18 kA DC-DC Modules                     | MS-XXXX (WP14)<br>Material for TDE Vessel                | MS-XXXX (WP15)<br>ITMB for MAFI-like          |  |  |   |   |        |                            |  |                                     |          |
| IT-XXXX (WP4)<br>High Power RF Lines - Circulator & loads | IT-4826 (WP1, WP15, WP17)<br>Rad-tol and Rad-hard cables | IT-XXXX (WP9)<br>Electrical Control Cabinets  |  |  |   |   |        |                            |  |                                     |          |
| IT-XXXX (WP4)<br>HPRF - IOTs - Transmitters               | IT-XXXX (WP17)<br>UPS FW Contract                        |   |  |  |   |   |        |                            |  |                                     |          |

|  |                                      |
|--|--------------------------------------|
|   | Cost estimation [50 kCHF, 200 kCHF]  |
|   | Cost estimation [200 kCHF, 750 kCHF] |
|   | Cost estimation > 750 kCHF           |
|  | Potential Non-competitive Tender     |









|  |                    |
|--|--------------------|
|   | Already dispatched |
|   | Under preparation  |
|   | Under discussion   |
|  | Cancelled          |



# Upcoming Procurement 2025

| 2025  |  |       |       |     |   |      |        |           |                                       |          |                                     |
|---|--|-------|-------|-----|---|------|--------|-----------|---------------------------------------|----------|-------------------------------------|
| January   | February                                 | March | April | May | June                                      | July | August | September | October                               | November | December                            |
| DO-XXXXX (WP5)<br>COMe CPU  | DO-XXXXX (WP8)<br>Absorber supports      |       |       |     | IT-XXXX (WP13)<br>BLM Electronics (ASIC)  |      |        |           | DO-XXXXX (WP8)<br>VAX Alignment Plate |          | MS-XXXX (WP17)<br>Batteries for UPS |
| DO-XXXXX (WP14)<br>Material for TDE<br>Dump Cores Flexible Graphite | DO-XXXXX (WP14)<br>Supporting Cradle TDE |       |       |     | IT-XXXX (WP13)<br>BLM Electronics (BLEIC) |      |        |           |                                       |          |                                     |
| MS-XXXX (WP13)<br>BLM Electronics (BLEIC)                           | IT-XXXX (WP5)<br>PXIe Carrier            |       |       |     | IT-XXXX (WP13)<br>BPM Electronics         |      |        |           |                                       |          |                                     |
| MS-XXXX (WP13)<br>BLM Electronics (ASIC)                            | MS-XXXX (WP13)<br>BPM Electronics        |       |       |     |   |      |        |           |                                       |          |                                     |
| MS-XXXX (WP14)<br>Material for TDE<br>Dump Cores Isostatic Graphite |  |       |       |     |   |      |        |           |                                       |          |                                     |
| IT-4857/58 (WP14)<br>Material for TDE<br>Dump Cores C-C composites  |  |       |       |     |   |      |        |           |                                       |          |                                     |
| IT-XXXX (WP14)<br>Material for TDE<br>Vessel                        |  |       |       |     |   |      |        |           |                                       |          |                                     |

- The HL-LHC Procurement Plan is mainly focused in the next 18 months. There will be some cases that be slightly shifted, and a very few cases will also be added after second half in 2025. The plan is to be updated accordingly
- The Plan does not include the tenders managed by EN-MME-FS (very strong Collaboration with the Project) or BE-CEM for electronics

|  |  |
|--|--|
|  Cost estimation [50 kCHF , 200 kCHF] |  Already dispatched |
|  Cost estimation [200 kCHF, 750 kCHF] |  Under preparation  |
|  Cost estimation > 750 kCHF           |  Under discussion   |
|  Potential Non-competitive Tender    |  Cancelled         |

# Main upcoming Contracts

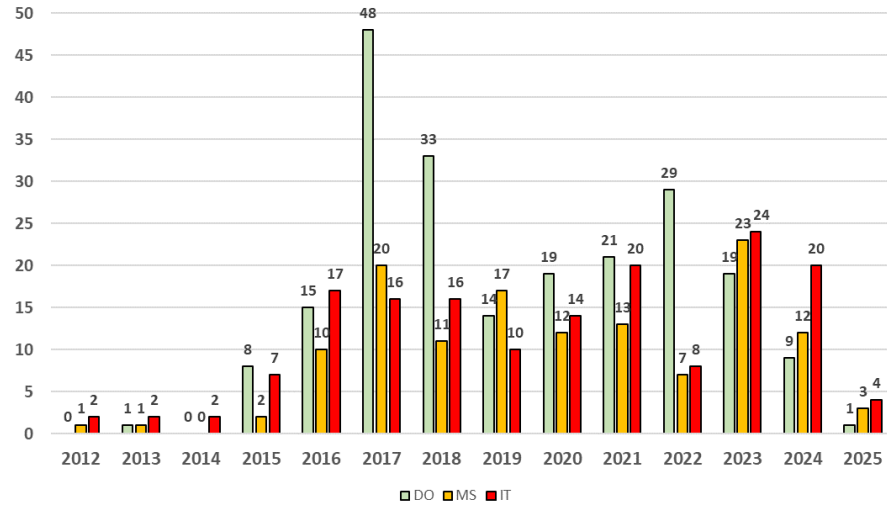
| WP    | Contract  | Award of the Contract  | Final Adjudication / Status  |
|-------|---|------------------------|--|
| 6B    | <b>I/O Power Modules and Crowbar 18kA Power Converters</b>              | FC Dec 2023            | Tendering on-going. Opening in early October (I/O modules tender combined with other projects so the contract will be awarded in the FC despite the amount for HL is below 750 kCHF). Crowbar modules below FC threshold |
| 17    | <b>66kV Transformer</b>   | TBC                    | Tendering on-going. Final price will trigger the date of adjudication  |
| 7     | <b>14kA Power Converters</b>  | FC March 2024          | Tendering on-going. Opening by end of October.   |
| 8     | <b>TAXN/TAXS Absorbers</b>  | TBC<br>(FC March 2024) | MS already on-going. IT under preparation  |
| 6B    | <b>R2E-HL-LHC 60-120A Power Converters</b>                              | FC March 2024          | MS dispatch to Firms   |
| 5     | <b>Supports for LS3 Collimators</b>                                     | TBC<br>(FC March 2024) | MS under preparation (SC already scheduled)  |
| 5     | <b>LS3 Collimators Production</b>                                       | FC June 2024           | Qualification campaign (as part of the MS) ongoing via production samples. IT under preparation  |
| 3/4/8 | <b>Jacks for HL-LHC</b>   | FC June 2024           | MS under preparation. Exposure calculated based on pre-series cost   |
| 17    | <b>Vertical Cores Excavation</b>  | FC June 2024           | MS launched. IT under revision at CERN   |
| All   | <b>Power and signal cables for HL-LHC (General Purpose Cables only)</b> | FC June 2024           | MS already sent out. Radiation campaign ongoing  |
| 4     | <b>High Power RF Stations (IOTs Transmitters, Tubes &amp; trolleys)</b> | FC Dec 2024            | In-kind Contribution under discussion otherwise tendering in 2024  |
| 4     | <b>High Power RF Lines (Circulators and Loads)</b>                      | FC Dec 2024            | In-kind Contribution under discussion otherwise tendering in 2024  |
| 14    | <b>Core Material for TDE Dump (graphitic material)</b>                  | FC June 2025           | MS already launched. HiRadMat test for final qualification prior to the call for tender – Final Design Review will trigger the material and quantities   |
| 14    | <b>Material for Vacuum Vessel TDE Dump</b>                              | FC June 2025           | R&D on-going – Final design review will trigger the final material and quantities  |



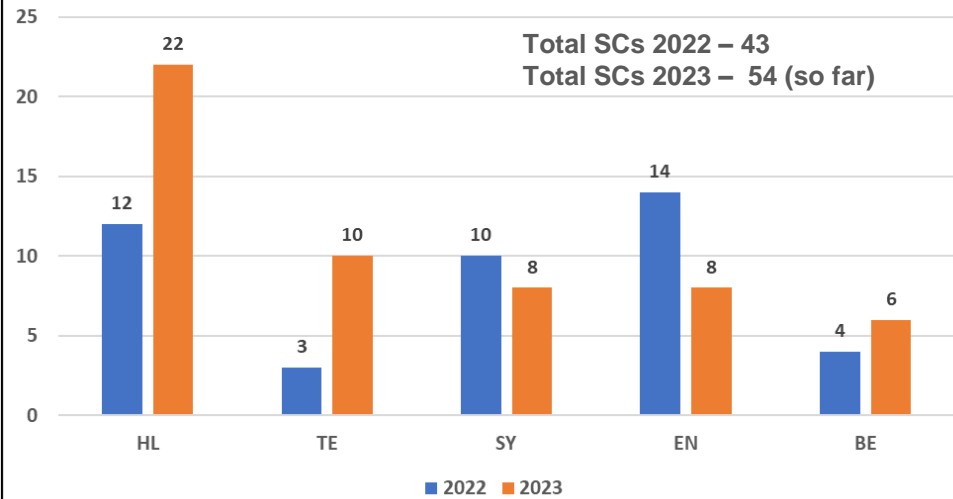


# Procurement Overview

DO/MS/IT per year



Specification Committees in the A&T Sector 2022-2023



- ❑ The number of **HL-LHC MS/ITs** is back to **pre-LS2 period**, mainly **due to the impact of the cancellation of the Russian Contribution and the re-insourcing by CERN**
- ❑ **However,...**there is also an important increase of cases for **HFM, NA CONS, ACC-CONS** and the **Framework Contracts** managed by the Technical Groups



# Outline

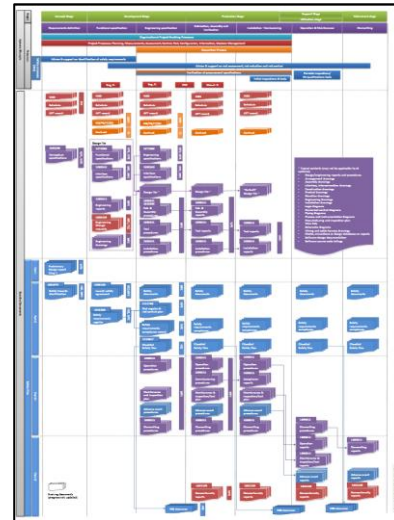
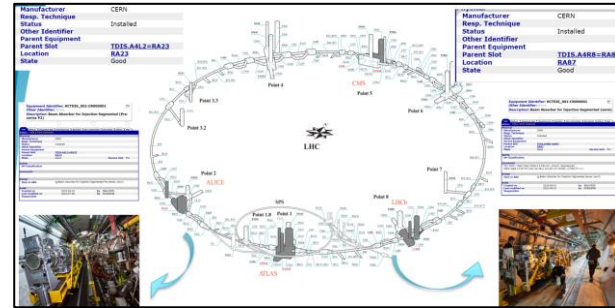
1. Procurement Overview
2. Status 2023
3. Upcoming procurement
4. **Quality**
5. Summary

# HL-LHC Quality recap

- **Quality** should be seen as an **investment** that is **well paid back not only** on the **medium & long term**, but also on the **short term**
- **Today's work** in **quality** and **documentation** will be a **major heritage** for **future generations** and for **operation** of the **LHC** after the **HL-LHC upgrade**
- In **large scale Projects**, with **high manpower turnover** (temporary contracts, students, etc) proper documentation (handling, storage, accessibility) becomes **critical** for the adequate **knowledge transfer** and to **trace back the work done before**
- **Culture of quality** in **HL-LHC** well implemented all across the Project (major effort made by **Isabel Bejar Alonso** since early stages) **CERN, Collaborations** and **Industries** are working in line with the HL Quality Plan requirements (**engagement** from HL community!)

# Quality - Documentation

- HL-LHC is in **full construction/production** mode, so it is **critical** to properly **record, handle** and **store** the manufacturing data
- QA/QC** is not a matter to believe or not but a matter of evidence
- Documentation** shall provide **evidence** of **conformity** with the **requirements** (which **does not imply** that on top, checks will not take place upon reception)
- It is **part of the scope** of any **Supply** and should not be undervalued
- We observe that **documentation** is **NOT** always provided in **timely manner**, and this leads to **overheads** in terms of **validation** and **approval** (room for improvement!)
- Request of deviations** wrt to requirements (we request to do something different from what was established) and **Nonconformities** (found **deviations** from requirements) are to be issued accordingly (**this is being the case!**)



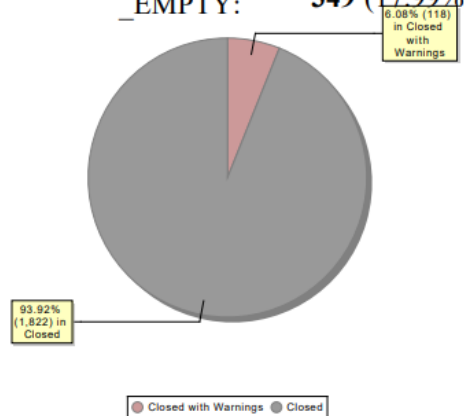
# Nonconformities

- Nonconformities in production play an important role in the project development
- They might have a severe impact on performance, cost and schedule, and therefore their treatment (description, (root cause) analysis and action plan) NEED TO be properly managed
- NCRs are NOT meant to seek for a guilty but to learn from the issues and avoid occurrence and recurrence (corrective and preventive actions)
- It is anyway a concern for the project and means/resources should be allocated to minimize the risks (The more we advance in the project lifecycle, the bigger the impact of critical NCs will be)

## NCRs CLOSED

Total NCRs: 1940

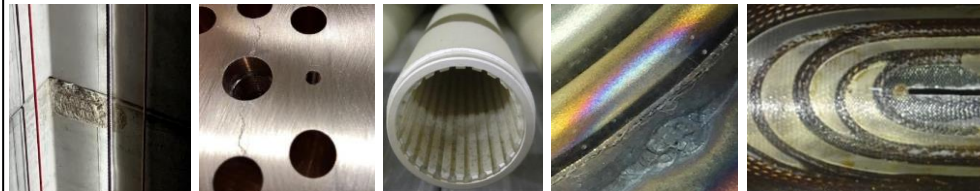
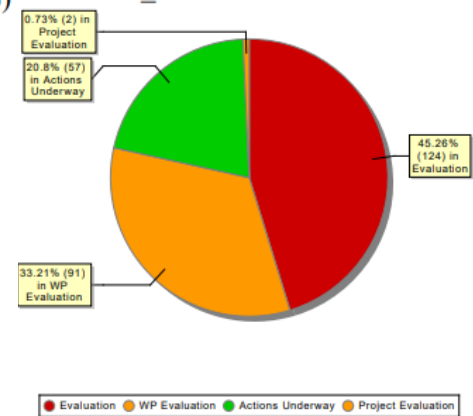
Critical: 309 (15.93%)  
 Non critical: 1,28 (66.08%)  
 \_EMPTY: 349 (17.99%)



## NCRs NOT YET CLOSED

Total NCRs: 274

Critical: 39 (14.23%)  
 Non critical: 122 (44.53%)  
 \_EMPTY: 113 (41.24%)



# Outline

1. Procurement Overview
2. Status 2023
3. Upcoming procurement
4. Quality
5. **Summary**

# Conclusions

- **2023-2024** – Still very intense period in terms of procurement. Full integration of the Russian plan Bs strongly impacts the workload of WPs and CERN Services
- **Tripartite effort** : Technical Teams + HL-LHC Procurement Office, Specification Committee, IPT – It requires the **best effort from the three** and **availability of resources** to avoid delays in tendering, adjudication of Contracts, and proper Contract's follow-up
- We are now **cohabiting** with other projects like **NA CONS, HFM**, etc for procurement. **No impact on HL** but **overheads** in the **procurement activities** for everyone involved
- **So far...not so bad** in terms of **outcome from procurement during 2023** – Final **results** and **updated risk exposure** to be presented in **CSR23**
- **QA/QC activities** in line with the **requirements of the HL-LHC Quality Plan** but still with some **room for improvement** (Continuous improvement!)
- **Nonconformities** are always a **concern** for any Project and might have **severe impact**. **Actions to be taken to avoid occurrence and/or recurrence**

## Last but not least....



**Big Thanks to Anders Unnervik, Jerome Pierlot and Bertrand Nicquevert for their continuous support, guidance and cooperation to HL-LHC throughout the last decade, very much appreciated!**

(All the best to **Cristina Lara, Josh Davison and Wim Weterings**)





***Many Thanks!!!***

HIGH LUMINOSITY LHC

13<sup>th</sup>

HL-LHC Collaboration Meeting  
Vancouver, Canada,  
25-28 September 2023

The 13<sup>th</sup> HL-LHC Collaboration Meeting, jointly organized by TRIUMF and CERN, will take place in Vancouver, Canada, from 25<sup>th</sup> to 28<sup>th</sup> September 2023, as an in-person meeting. Based on the traditional programme with plenary and work package parallel sessions, this meeting will serve as a technical update forum for the 7<sup>th</sup> Cost and Schedule Review planned at CERN in November 2023, the kick-off

of the Canadian contribution to the production of the Crab Cavity cryomodules and provide the framework for additional collaborative meetings between the project partners. The main objectives will be to update all HiLumi collaborators on the advancement of the series

production of components for the IT String test stand installation at CERN and to update all collaborators on the latest schedule changes.

**CERN – Organizing Committee**

Oliver Brüning *Project Leader*  
Markus Zerlauth *Deputy Project Leader*  
Cécile Noels *Project Office*  
Irene Garcia Obrero *Project Office*

**TRIUMF – Local Organizing Committee**

Oliver Kester *Chair, Director of Accelerator Division*  
Bob Laxdal *Project Coordinator*  
HL-LHC crab cavity cryomodules  
Jana Thompson *Conference Facilitator*  
Pauline Dela Zilwa *Administrative Assistant*  
Accelerator Division

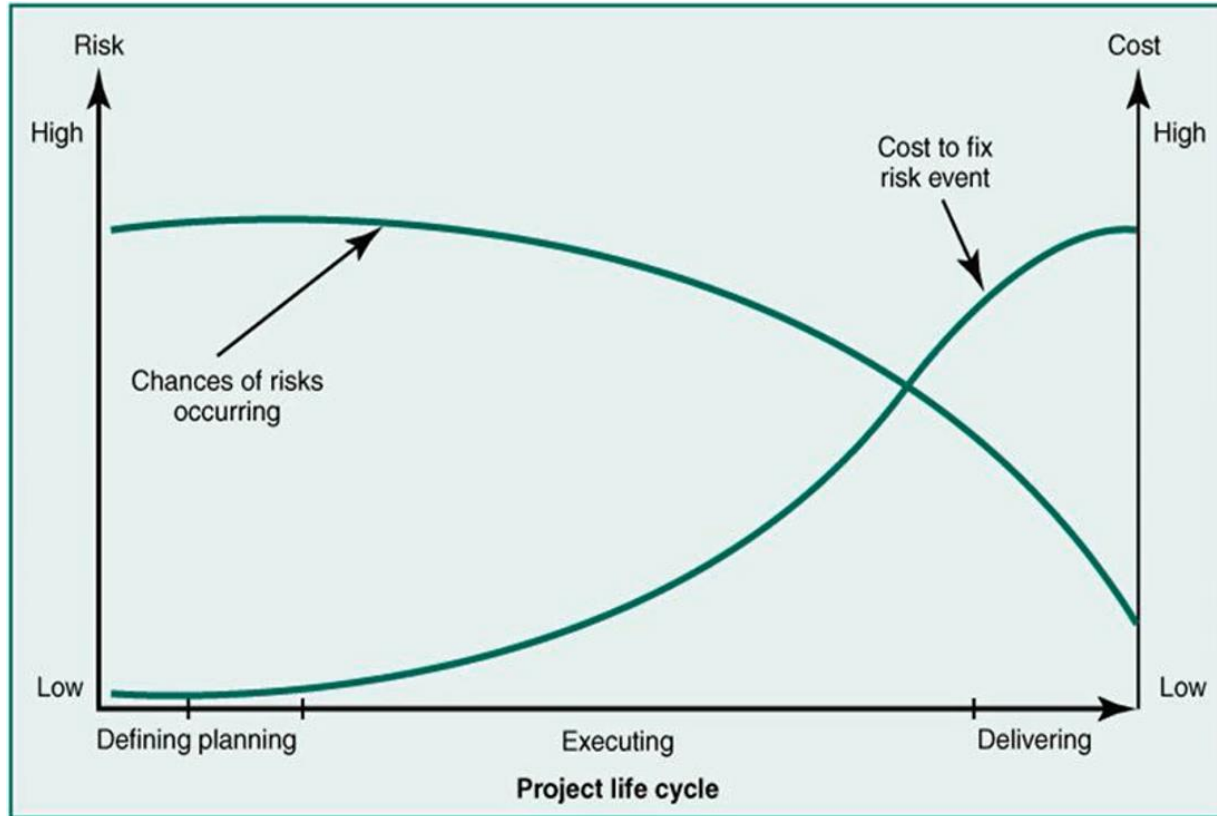
For more details and registration : [HL-LHC.Secretariat@cern.ch](mailto:HL-LHC.Secretariat@cern.ch) / [hilumihc.web.cern.ch](http://hilumihc.web.cern.ch)






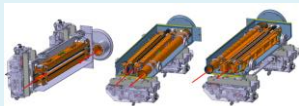






## ***Spare Slides***

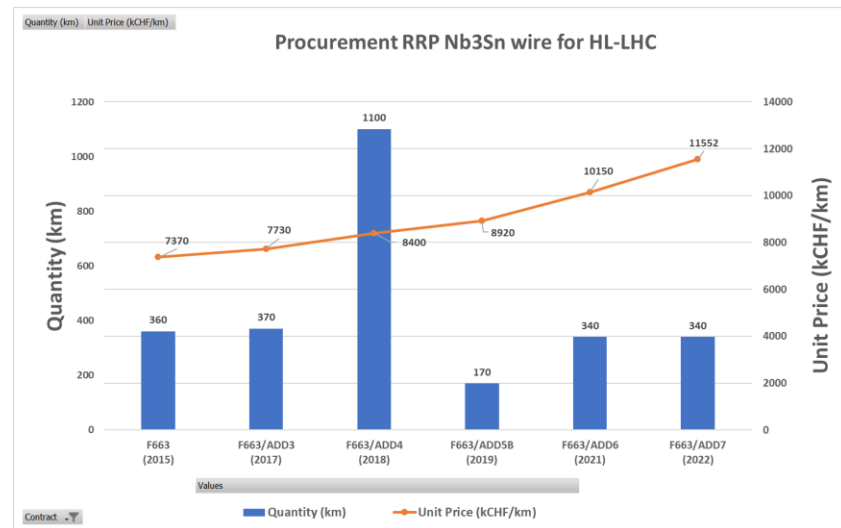
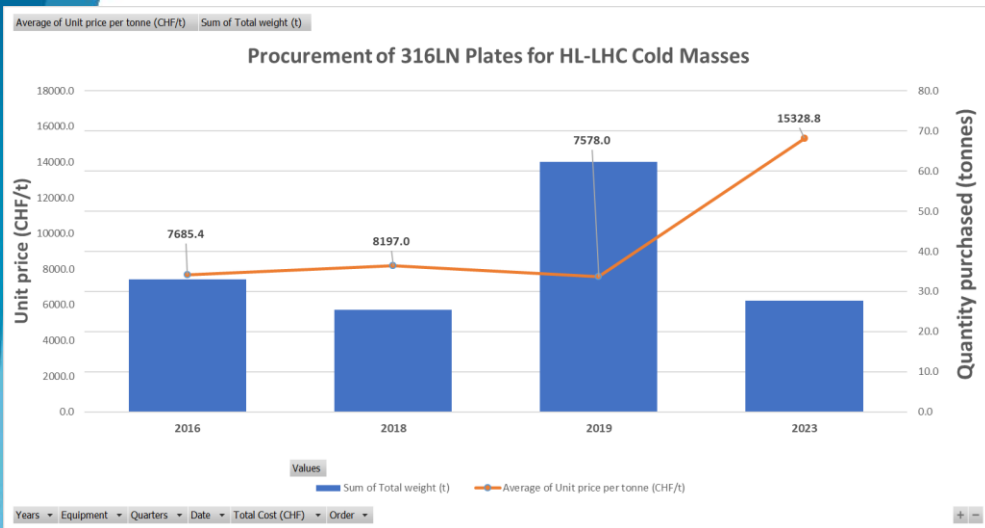
# Risk in project life cycle



# Russian in-kind (impact on HL-LHC Procurement)

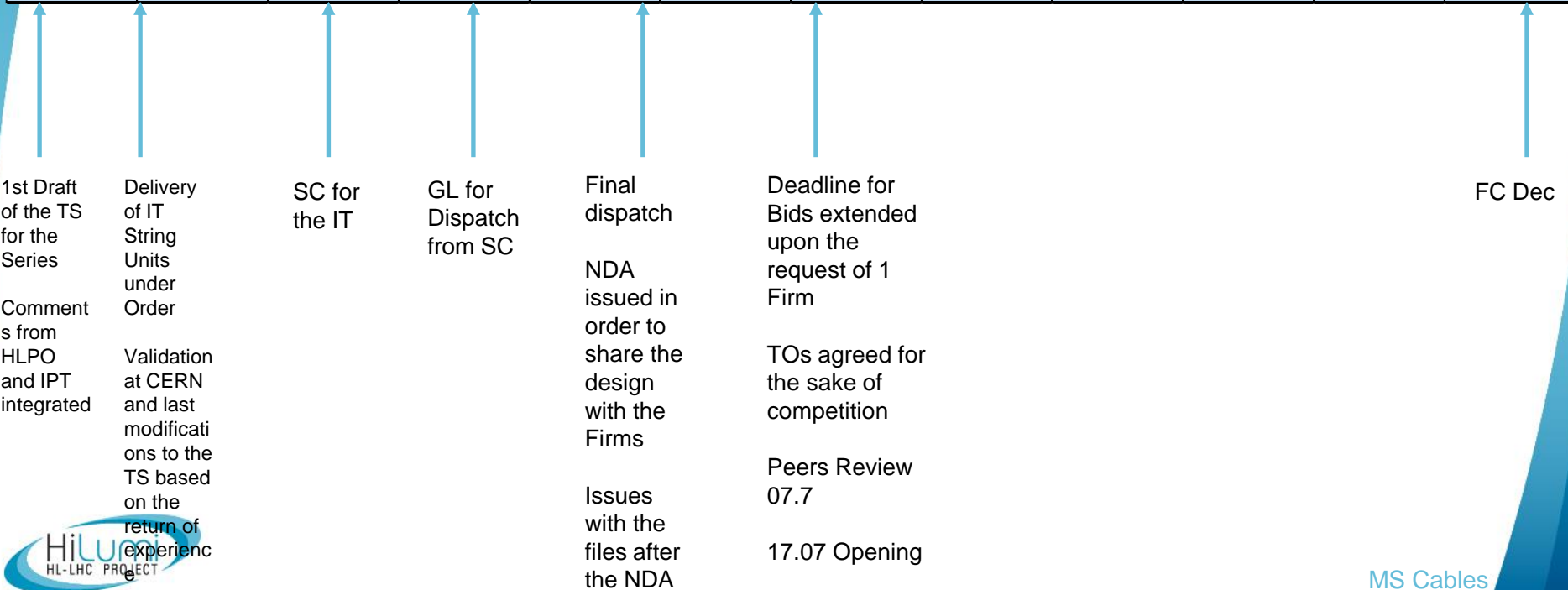
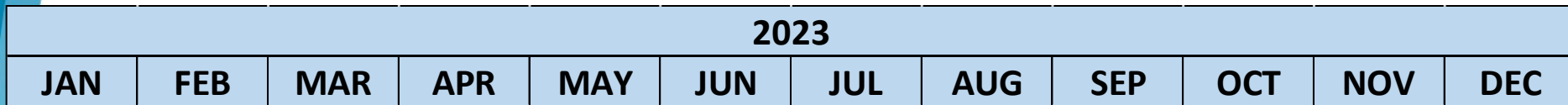
|  |   |  |
|--|---|--|
| <p><b>Crystal collimators V3</b></p>           | <p>2 units successfully produced and installed end of LS2, 4 additional units on-going production at CERN for installation in the EYETS22 (Procurement of main components driven by SY-STI)</p>   |   |
| <p><b>Resistive part HTS Current Leads</b></p> | <p>Already integrated in the Procurement plan. Production is taking place at CERN (EN-MME Main Workshop). Price Enquiries for Raw Materials and finished components launched by EN-MME-FS (Major effort during 2022)</p>  |   |
| <p><b>BPM mechanical bodies</b></p>            | <p>Already integrated in the procurement plan. Production is taking place at CERN (EN-MME Main Workshop) as we already built the pre-series (to cope with the urgent needs). Raw materials were already purchased, other components (electrodes, feedthroughs on-going)</p> |   |
| <p><b>LS3 Collimators and masks</b></p>        | <p>Major impact (about 20 contracts to be signed for components/materials plus the contracts for production). All the upcoming contracts have been integrated in the HL-LHC procurement plan.</p>   |   |
| <p><b>RF transmission chain</b></p>            | <p>Re-integrated in the plan (looking for an alternative as Collaboration).</p>   |   |
| <p><b>TAXN, TAXS, Vacuum Chambers</b></p>      | <p>Integrated in the plan – MS and IT for TAXN, TAXS Cu absorbers. Y-chamber production in-house (1+4 units)</p>  |   |
| <p><b>BLM (25% HL-LHC)</b></p>                 | <p>Reverse engineering and production of few prototype units by MME. Plan for the Series under discussion (in-house vs manufacturing in Industry)</p>   |   |
| <p><b>High Power RF</b></p>                    | <p>High Power RF – developed with IOTs (looking for an alternative as Collaboration) – Market Survey to be launched at CERN</p>   |  |

# Procurement & Risk



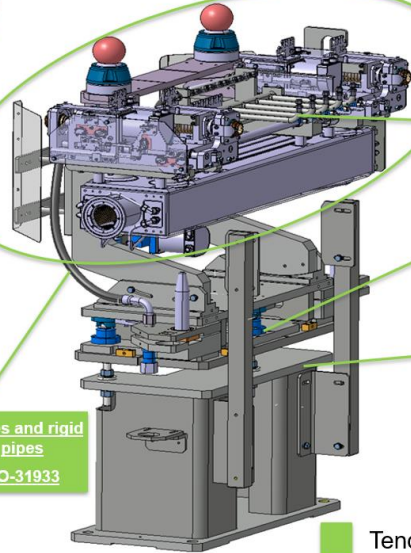
# Energy Extraction Systems for HL-LHC

Target FC  
September  
(04.10.23)



# Make or Buy Plan

## HL-LHC LS2 collimators procurement



**LS2 Collimators Production**  
(5 TCPMP, 10 TCSPM & 5 TCLD)  
DR-6490686 - IT-4272

**Manifolds**  
DR-7427660 – DO-31931

**Plug-in system (Connectors)**  
DR-6854219 – Single Tender

**Fixed Supports**  
DR-6854220 – DO-31249

**Jacks TCLD collimators and WP11 Cryostats**  
DR-7158169 - DO-31326



- Tendering finished
- Tendering on-going
- Tendering not started



## HL-LHC LS2 collimators procurement

**Jaw Absorber Blocks**  
MoGr (TCPMP, TCSPM)  
DR-6272020 - IT-4201  
Tungsten Heavy alloy  
TCLD (<50k, No DR)

**Stainless Steel 304L, 316L & 316LN**  
<50k (Central Stores)

**LVDT**  
DR-6734749 – IT-3425

**Rad-hard Switches**  
DR-7478086 - DO-31829



**Glidcop for back stiffener & housing blocks**  
DR-6850041 - Single Tender

**Bake-out jackets**  
DR-6891552 – DO-30880

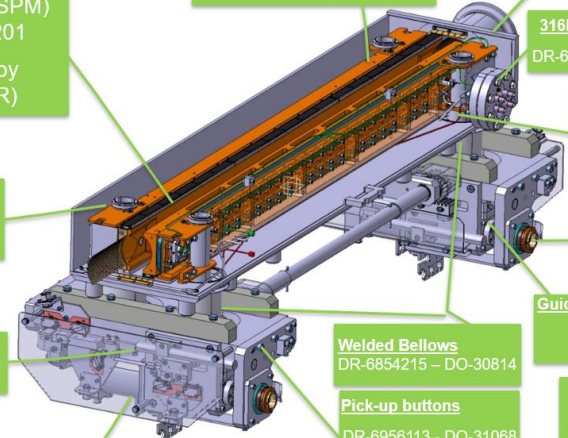
**316LN Connector Flanges**  
DR-6849315 - DO-31067

**Vacuum Si<sub>3</sub>N<sub>4</sub> Cables**  
DR-6843955 – Single Tender

**Roller Screws**  
DR-6854217 – Single Tender

**Guiding Shaft & Bearings**  
DR-6854216 – Single Tender

**External Cable assemblies**  
DR-6849313 +  
DR-6956223  
DAI-7981796 +  
DAIs for 'Plan B'



**Welded Bellows**  
DR-6854215 – DO-30814

**Pick-up buttons**  
DR-6956113 - DO-31068  
DO-31045

**Stepped Motors**  
DR-6723429 – IT-3385

**Control Systems**  
Framework contract

- **Bottom-up approach** in order to identify what can be produced with industrial partners
- **Breakdown of Contracts** to be included within the **HL-LHC Procurement Plan**

Procurement Plan - [EDMS 1713304](#)



# HL-LHC Procurement Plan - Briefing

- Acquisition process is a valuable input for the **Project Planning** and **Follow-up**. Procurement can be used as one of the project progress indicators. **Delays** in procurement will likely have **impact** on the **activities that will follow**
- HLPO has been driving the **Make or Buy Plan (Procurement Plan)** since **2015**:
  - Plan for all tenders (**contracts**) above **50 kCHF** for the next (**at least**) **18 months** in line with the Project Master Schedule
  - Fostering **Transparency, Equality & Competitiveness (CERN Financial Rules)** – **Close cooperation between the Project and IPT**
  - Launch the procurement the **earliest possible**. Early procurement allows identifying alternatives, building **schedule margin** and **absorb** potential **delays** during the production. It also **avoids** specifying **excessively aggressive delivery schedules** (impact on **cost and number of Bids received**)
- The HL-LHC Procurement plan is regularly shared and discussed with IPT and other stakeholders (ILOs, SC Chairman, etc.)