# LS2 Cooling & Ventilation Activities

M. Battistin EN/CV

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LS2 DAYS

29-30 SEPTEMBER 2015

http://indico.cern.ch/event/436424/

# Agenda

- Introduction
- Projects
  - Presented in geographical order
  - Some details on main projects
- CV Maintenance
- Conclusions

# Introduction

- LS2 workload
  - CV presents the list of **potential** projects and expected worksite duration (design & tendering phases are not shown);
  - Not all the list is supposed to be realised;
  - CV-**Consolidation:** to be approved by consolidation PL (M. Benedikt);
  - CV-clients interactions to define **new installation** requirements;
  - CV-MEF iterations to define **planning** (plan tool);
- Real duration of LS2 for CV
  - Some CV installation needs to be available in the middle of LS2 (LS2 for CV will be shorter).

Good planning + increase of flexibility

# List of possible CV activities 2015-2021

- Geographical groups:
  - Meyrin
  - PS – PSB – EA
  - Prevessin – NA
  - SPS
  - LHC Machine
  - LHC Experiments
  - General CERN
- Tentative time slot + duration of each work phase.

An overview first of all…

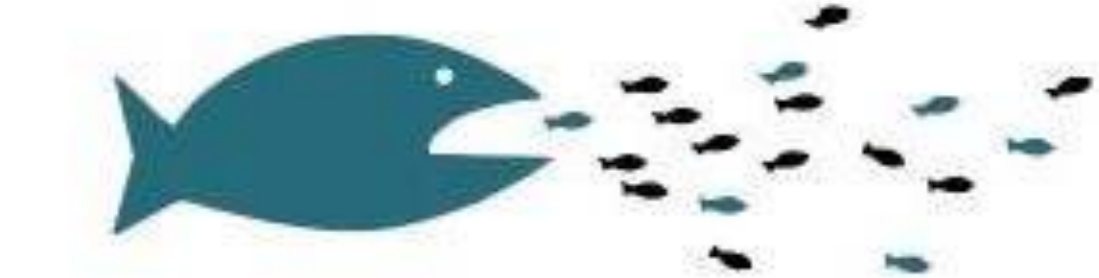
# General overview 2015-2021 (months of worksites)

| | 2015 | YETS 15-16 | 2016 | EYETS 16-17 | 2017 | YETS 17-18 | 2018 | LS2 19-20 | 2021 | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| Meyrin | 7 | 4 | 7 | 2 | 28 | 0 | 0 | 47 | 0 | **95** |
| PS + PSB + EA | 0 | 0 | 24 | 4 | 4 | 0 | 4 | 186 | 0 | **222** |
| Prev + SPS + NA | 15 | 9 | 33 | 16 | 34 | 9 | 13 | 86 | 0 | **215** |
| LHC + LHC Exp | 16 | 13 | 17 | 12 | 14 | 1 | 20 | 81 | 48 | **222** |
| Divers | 12 | 1 | 12 | 1 | 0 | 1 | 0 | 1 | 0 | **28** |
| **Total** | **50** | **27** | **93** | **35** | **80** | **11** | **37** | **401** | **48** | **782** |

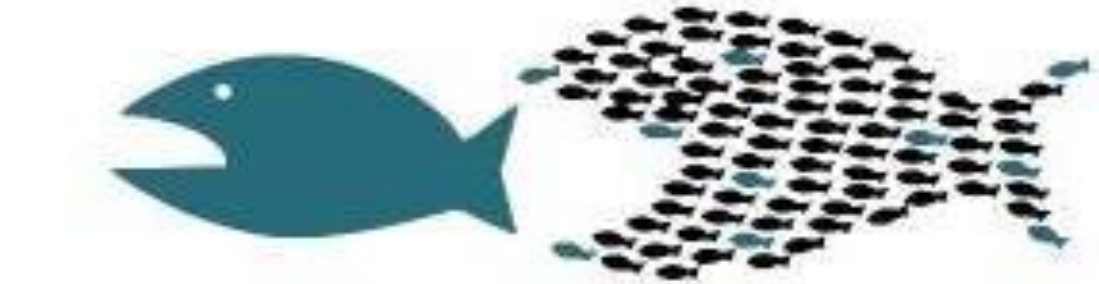
CV LS1 consolidation workload represented about 25 MCHF, the consolidation activities in this list for LS2 correspond to about 45 MCHF.

CV **consolidation strategy**: LS1-LHC, LS2-PS, LS3-SPS.

How to deal with these figures…



**Don't panic,**



**ORGANIZE !**

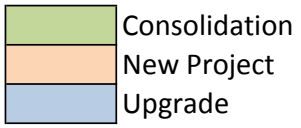
# Meyrin Projects

Consolidation
New Project
Upgrade

| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Meyrin** | Install new HVAC in bldg 228 for EL station | 1 M | | | | | | | | |
| **Meyrin** | Consolidation of the chilled water distribution in ISR | | | | ? | | | | | |
| **Meyrin** | Consolidation of the ventilation in the Computing Center 513 | | | | ? | | | | | |
| **Meyrin** | Consolidate the Meyrin (Bdg 200) compressed air station | 4 W | 8 W | | | | | | | |
| **Meyrin** | Consolidate the HVAC of West Experimental Hall (bldg. 180 and 181) | | | | | 8 M | | | | |
| **Meyrin** | Machine buildings consolidation Meyrin and Prevessin sites | | | X | X | X | X | | | |
| **Meyrin** | Replacement of the Siemens S5 cards in the cooling plants of Meyrin | | | | | | | | 4 M | |
| **Meyrin** | Consolidate bdg 513 ventilation control to system to PVSS-UNICOS | | | 10 W | | | | | | |
| **ISOLDE** | Consolidate el, instr, & control systems of the ventilation of ISOLDE Tunnel | | | | 8 W | | | | | |
| **Meyrin** | B_107 water HVAC | | | | | 12 M | | | | |
| **Meyrin** | Install HVAC & cooling water circuits bdg 311 | | | | | 8 M | | | | |
| **Meyrin** | FAIR: S-FRS cryo-magnet test station in B180 | 3 M | 2 M | | | | | | | |
| **Meyrin** | Install HVAC in building 238 | 2 M | | | | | | | | |
| **Meyrin** | Install temperature control 0-40°C on Bdg 212 ME9 | | | 4 M | | | | | | |
| **Meyrin** | Install new magnet cooling in bdg 185 | | | | | | | | | |
| **ISOLDE** | ISOLDE Target Area New Ventilation & Cooling Installation | | | ? | | | | | | |
| **Meyrin** | Linac4 power converter installation | | | ? | | | | | | |

- Bdg 107 and 311 projects are the to major project on Meyrin (out of accelerators zones)
- Activities mainly free from LS2 constraints

# AD complex consolidation




| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| AD | Consolidate the AD bdg 193 cooling tower and demi water cooling | | | | | | | | 12 M | |
| AD | Consolidate the AD bdg 193 complex ventilation systems | | | | | | | | 15 M | |
| AD | Consolidate the AD target ventilation system | | | | | | | | 8 M | |
| AD | Consolidate the AD target cooling station | | | | | | | | 8 M | |

- **CV considers the AD complex consolidation more critical than the East Area one.**
- New **air handling units** for the AD hall
  - In addition the the HVAC system is supplied by **drinking water in open circuit** and represents a considerable consumption (up to 110 $m^3/h$).
- New local **chilled water** production (1.5 MW);
  - Chilled water production: CV is evaluating a **general strategy** for the chilled water production in the PS-PSB-513-ISOLDE-AD area;
- New **cooling tower** (7 MW) + demi water station;
- The **AD target** zone CV installation shall be completely refurbished ➔ design well advanced with STI;
- **ASBESTOS removal** is a general problem ➔ **see dedicated slide later**

# PS – PSB – EA

Consolidation
New Project
Upgrade

| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| PSB | POPS-B - 245 - Ventilation | | | 12 M | | | | | | |
| PSB | POPS-B - 245 - Cooling | | | 12 M | | | | | | |
| PS | POPS - Install an additional demi water cooling circuit for the dummy load | | | | 1 M | | | | | |
| PSB | PS Booster demineralised water cooling plant consolidation | | | | | | | | 12 M | |
| PSB | PS Booster primary water circuit consolidation | | | | 3 M | | | | | |
| PSB | Consolidate the PS Booster chilled water production | | | | | | | | 12 M | |
| PSB | Consolidate the PS Booster ventilation system | | | | | | | | 12 M | |
| PS | Consolidate the PS Complex chilled water production system | | | | | | | | 12 M | |
| PS | Consolidate the PS Complex chilled water piping - Phase II | | | | | | | | 10 M | |
| PS | Consolidate the PS central building cooling station | | | | | | | | 12 M | |
| PS | Consolidate the PS main magnet cooling station | | | | | | | | 12 M | |
| PS | Replace HVAC regulation on bldg. 363 - Linac2 | | | | | | | | 12 M | |
| PS | Consolidate the LEIR and Linac2&3 cooling station | | | | | | | | 12 M | |
| PS | Replacement of HVAC for Linac 3 | | | | | | | | 12 M | |
| PS | Consolidate the warm water network in the PS tunnel | | | | | | | | 8 M | |
| PS | Consolidate the warm water network outside the PS tunnel | | | | | 4 M | | 4 M | | |
| PS | Consolidate the ventilation duct in PS tunnel | | | | | | | | 12 M | |
| PS | HVAC building in PS complex | | | x | x | x | | | | |
| PS | Consolidate the PS compressed air piping | | | | | | | | X | |
| PS | Consolidate PS & SPS primary loops (legionella linked upgrades) | | | | | | | | 10 M | |

- The PS consolidation represent the largest effort for CV during LS2.

# Consolidate PSB water cooling plant

## Primary water (Bat. 237)

- Old cooling towers (increased legionella risks), pumping equipment and hydraulic accessories to be replaced;

## Demineralized water (Bat. 237)

- For radioprotection constraints, the surface premises circuit shall be **separated** from the **tunnel circuit**;
- New magnets increased pressure drop -> the tunnel circuit **pressure rating** to be increased from PN16 to PN25;
- New cooling system for to C16-RF cavity (on **drinking** water today);
- New piping distribution in Bat. 361 (BRF2 room) for new Power Converters.

**Considering the amount of work foreseen in this area for LS2, CV plans the installation of the primary water system (new towers on top of Bat. 141 or 269 plus some piping) before the start of LS2.**

**This project is not officially approved in the Consolidation Plan yet.**

# Consolidation of PSB ventilation

**Underground ( ≈ 300 kW, air supply @ 20°C )**
- Dismantling of the old ventilation units
- Installation of two new air handling units (2 x 35'000 $m^3$/h);

**Surface system ( ≈ 500 kW, air supply @ 20°C):**
- Dismantling of the old ventilation units;
- Installation of two new handling units (2 x 63'000 $m^3$/h);

**Smoke extraction**

**Chilled water:**
- Refurbishment of the production;

**Asbestos:** uncertainty on the cost
- the presence of asbestos to be removed
- radioactive waste management?
- concrete structure of existing units to be demolished.

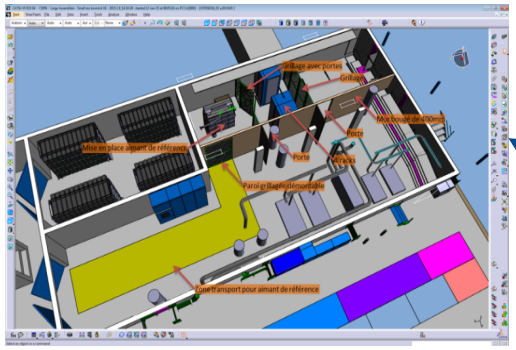
One of the 4 AHU's to replaced

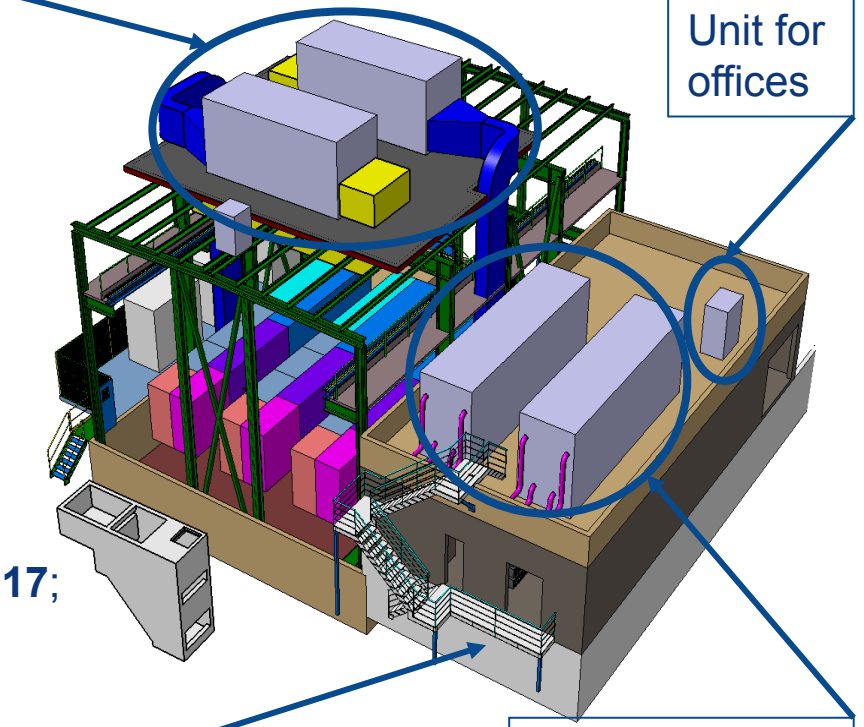
- ❑ It is not foreseen to change any **existing ducts**.
- ❑ At least **6 months for demolishing** existing units and installation of the new ones.
- ❑ **NO mechanical ventilation** up to the installation of the new AHUs (manual mode) about 6 months at the LS2 start-up
- ❑ **No advance work** will be possible before start of LS2.
- ❑ Overlap with other activities in the same area (i.e. PSB cooling or chilled water) still to be investigated.

# POPS-B (new MPS for the PSB-LIU) B 245

- **User requirements** well defined for CV (EDMS1327071);
  - demi water cooling power about 500 kW;
  - ventilation cooling power about 170 kW;
- general integration is running now;
- 245 building under construction;
- Small demi water cooling skid to be installed at POPS for the dummy load magnets;

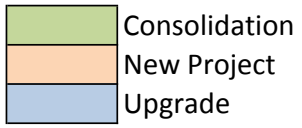
- ❑ CV installation to **start end of 2016**;
- ❑ Cooling and HVAC commissioned by **August 2017**;






S. Moccia contribution

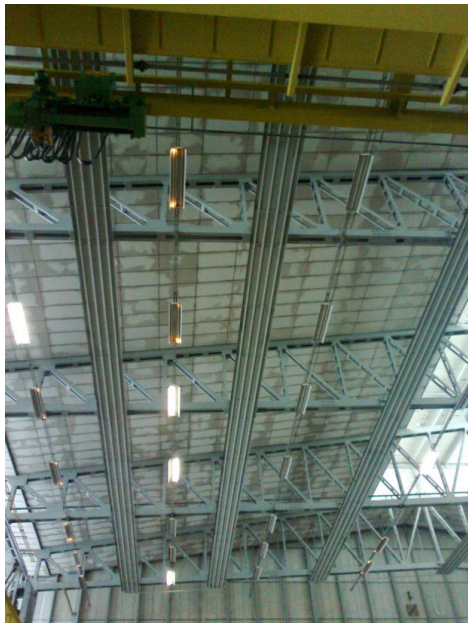
# EAST AREA




| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **EA** | Consolidate the East Area cooling plant | | | x | x | x | | | | |
| **EA** | Consolidate the Ventilation system of the East Area Hall | | | | | | | | 12 M | |
| **EA** | Consolidate the ventilation of the East Area Primary Zone | | | | | | | | 8 M | |
| **EA** | Install new cooling station (towers, primary and demi) for the East area | | | | | | | | 6 M | |

This project (cooling + ventilation) is not considered as a priority within the CV consolidation plan; in the present conditions the systems should be still operational after LS2 and could be refurbished during LS3. However, this project is presented following a request to plan a complete consolidation for the EA hall in LS2 and has to be considered only within that frame.

# East Area Hall



VENTILATION

- Consolidate the existing HVAC system (hall + barracks)
- Keep the existing configuration (radiant panels + AHUs)
- Replace the overheated water distribution network
- Works duration: 6 months

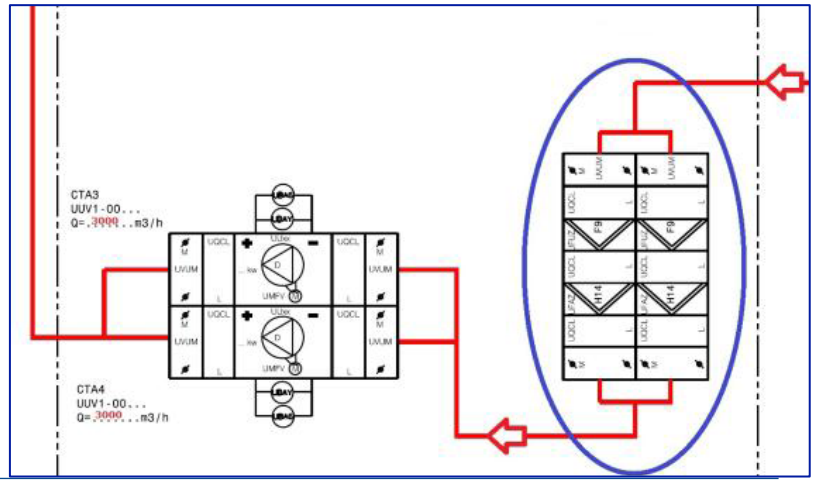
COOLING

- Separate radioactive and not radioactive the cooling circuits;
- Create a new cooling station in bldg.157 dedicated to the primary zone, with cooling towers outdoor (locations to be studied / validated);
- Works duration: 12 months.

P. Pepinster contribution

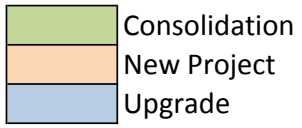
# East Area - Primary Zones Ventilation

- Provide dynamic confinement to the zone
  - NB: a good static confinement (air-tightness) of the zone is required to assure the confinement of the nuclear installation
- Works:
  - Similar to nTOF and CHARM/IRRAD
  - Primary zone in underpressure < -5 Pa
  - New HVAC system including HEPA filtration on air extraction
- Works duration: 6 months




P. Pepinster contribution

# Prevessin – NA




| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| **NA** | North Area Cooling Towers reject water consolidation | | | | | | | | ?? | |
| **NA** | Consolidate the cooling stations in the North Area | | | | | | | | 12 M | |
| **NA** | Consolidate the NA Chilled Water network - phase II | | 3 M | | 3 M | | 3 M | | 8 M | |
| **NA** | Consolidate the North Area cooling towers power and control system | | | | | | 2 M | | | |
| **NA** | Consolidate the NA underground ventilation elect, instr & control systems | | | | 10 W | | 10 W | | | |
| **NA** | Consolidate the ventilation of the BA81 and BA82 PC rooms | 2 M | | | | | | | | |
| **NA** | Consolidate BA80, BA81 and BA82 HVAC systems | | | 3 M | | 6 M | | 3 M | | |
| **NA** | Consolidate the CV systems of EHN1 | | | 6 M | | 12 M | | | | |
| **Prevessin** | Consolidate the compressed air production of the Prevessin site | | | | 8 W | | | | | |
| **NA** | EHN1 building extension | | | 8 M | 4 M | | | | | |
| **Prevessin** | New IT-HUB HVAC Installation | | | | | 6 M | | | | |
| **Prevessin** | CCR non critical control renewal | | | 3 W | | | | | | |
| **Prevessin** | BAF3 RF Building - Cooling & Ventilation | | | 5 M | | | | | | |

- MEF proposes a large consolidation activity of **EHN1** in 2016-2017
- The BAs buildings in the North Area complex have been built in the late 70's and never refurbished since. The major problems encountered are related to their **aging** conditions and the increasing number of **breakdowns**.
- Chilled water network **phase II**: **asbestos removal** and **radioactive waste**

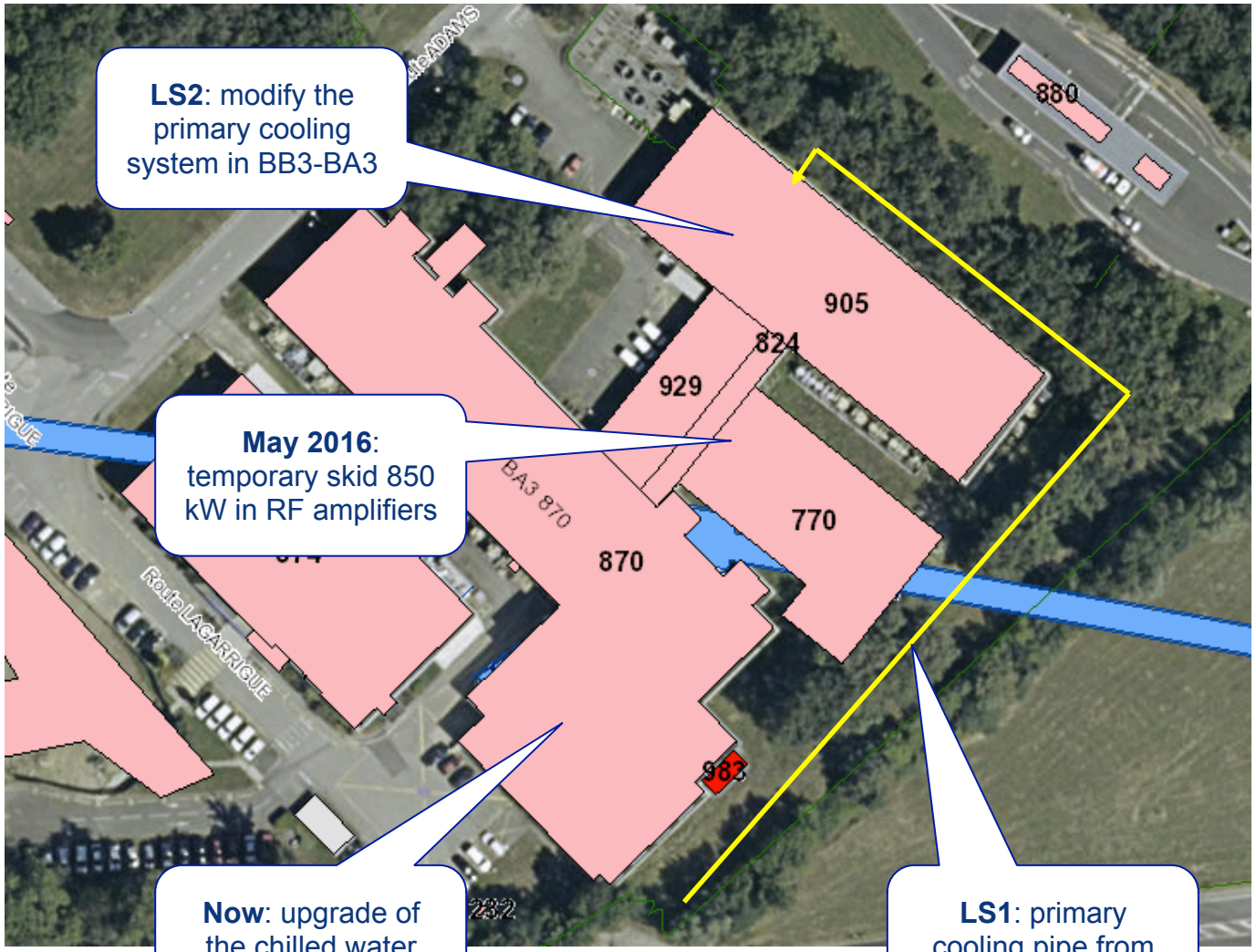
# SPS projects

Consolidation
New Project
Upgrade

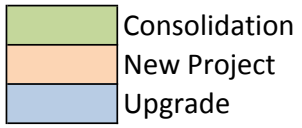
| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| SPS | Modify the BB3-BA3 primary water system | | | | | | | | 12 M | |
| SPS | BA3 SPS underground cavities cooling | | | | | | | | 12 M | |
| SPS | BAs Chilled Water Stations Control System Renewal | 6 W BA2-3-4 | | | 4 W BA6-7 | | | 2 W BA81 | | |
| SPS | Consolidate the SPS discharge waste water systems, raising pumps | | 4 W | | 4 W | | 6 W | | 4 M | |
| SPS | Consolidate elec. and cont. of the vent. system of the SPS surface buildings | | | 3 M | | 6 M | | 6 M | 6 M | |
| SPS | Consolidate piping in the SPS complex | | | | | | | | X | |
| SPS | Replacement of the Siemens S5 cards in the cooling plants of SPS | 1 BA - 3w | | 3 BA - 9w | | | | 5 BA - 15w | | |
| SPS | Consolidate the ventilation of the SPS PC rooms in the BA buildings | | | | | | | | 2 M | |
| SPS | Consolidate BA6-863 cooling control system to system to PVSS-UNICOS | | | | | | | | 9 W | |
| SPS | Consolidate the SPS infiltration water discharge from SPS loop to waste water | | | | | | | | 12 M | |
| AWAKE | AWAKE surface de-humidification system | | | 4 M | | | | | | |
| SPS | SM18+BB3 demineralised water skid | | | 3 M | | | | | | |
| SPS | Install the cooling system for the new SPS dump in LSS5 | | | | | | | | 2 M | |
| SPS | SPS HVAC for the new EL control surface buildings | | | | | 4 M | | 4 M | | |
| AWAKE | AWAKE project | 12 M | | | | | | | | |
| AWAKE | AWAKE Laser Cooling System | 1 M | | | | | | | | |
| SPS | BA3 new chilled water station | | 3 M | | | | | | | |
| SPS | Modify the SPS ventilation for fire safety improvement | | | | | | | | 12 M | |

- BB3-BA3 cooling system revision is the large strategic project in the SPS area for LS2
- Safety issues on reject of SPS infiltration water into the SPS loop
- SPS ventilation safety improvement project started now possible important impact on tunnel ventilation

# Second phase of the BB3-BA3-BAF3 project



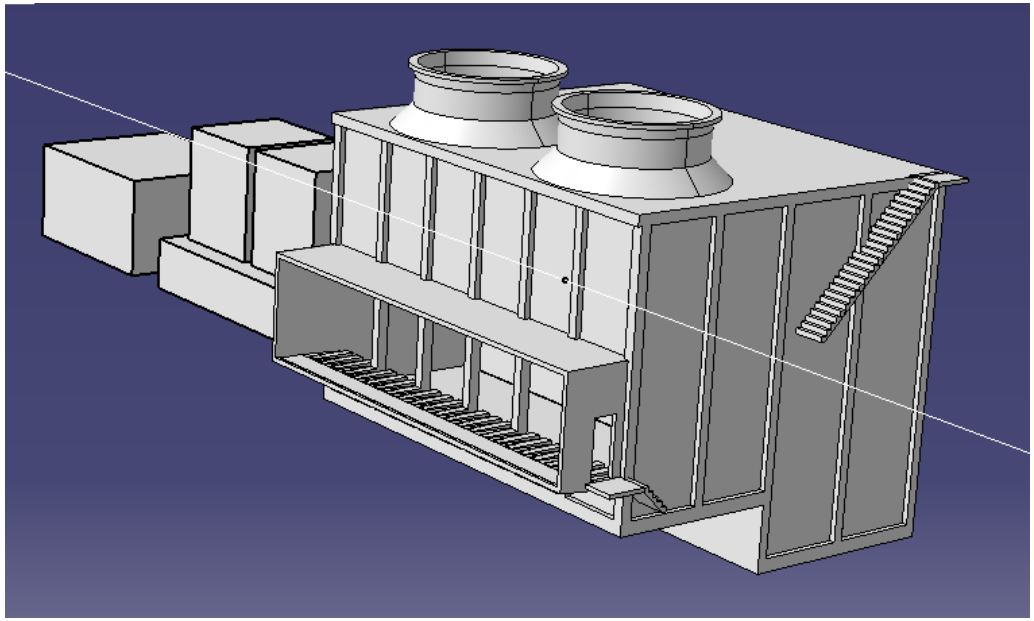
# LHC machine projects




| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| LHC | SR8 Ventilation units installation | 2 M | | | | | | | | |
| LHC | Control re-engineering of UJ56 | | | | 2 W | | | | | |
| LHC | PM32 Relevage Pumps Installation - phase II | | 4 W | | | | | | | |
| LHC | LHC Surf. Build. Ventilation SCADA SYSTEM Replacement | | 9 W | | 12 W | | | | | |
| LHC | Consolidate the control systme of LHC tunnel ventilation from PcVue (150 PLC) | | | | | | | | | LS3 |
| LHC | Consolidate SU1 amd USA15 cooling control system to PVSS-UNICOS | | | | | | | | 3 W | |
| LHC | Consolidate SU4 cooling control system to PVSS-UNICOS | | 3 W | | | | | | | |
| LHC | Consolidate the SR1-2-3-5-6-7 AHUs | | 4 W | 16 W | 16 W | | 4 W | | 16 W | |
| LHC | Replacement of SF2/4/6/8 ventilation unit | | | X | X | | | | | |
| LHC | Consolidate the fire fighting pipeline for LHC surface points | | | | | | | | 4 M | |
| LHC | Consolidate the compressed air plants for LHC | | | | | | | | 6 M | |
| LHC | Consolidate the electrical cabinets of the cooling system of SEQ (elec+control) Pt4, 6, 8 | | | | | | | | 2 M | |
| LHC | Renewal of the warm water recuperation systems in LHC | | | | | | | | 8 M | |
| LHC | Replacement of fan and motor of TU46-TU64-TU84 ventilation units | | | | | | | | 6 M | |
| LHC | Consolidate the LHC SE ventilation system | | | | | 8 M | | | | |
| LHC | Consolidate PM18 Cryo cooling system | | 4 W | | | | | | | |
| LHC | PT18 Primary Cooling Towers Upgrade | | | | | | | 12 M | 12 M | |
| LHC | Hi-Lumi prestudy | | | | | | | | | 48 M |

- New cooling tower at point 18 is the major intervention for LHC zone;
- The HL-LHC design and purchase phases run during LS2 -> resources.

# Replacement of STP18 cooling towers



- Upgrade of primary water from 3-cells tower (6 MW) to 2-cells tower (16 MW)
- Construction of new concrete 2-cells tower in **2018**;
- Installation in the pumps room and buried distribution pipes in **2019**;
- **Support from GS** is required for the new concrete building.

# ALICE & ATLAS

Consolidation
New Project
Upgrade

| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| ALICE | New 200 m2 clean room for ITS assembly in bdg 167 | | | 4 M | | | | | | |
| ALICE | Upgrade the ALICE ITS ventilation system | | 2 M | | | | | | | |
| ALICE | Upgrade the assembly clean room for ALICE in SXL2 | | | 3 M | | | | | | |
| ALICE | Upgrade of the TPC cooling system | | | | | | | | 4M | |
| ALICE | ALICE New computer farm cooling | | | | | 6 M | | | | |
| ALICE | Install ventilation system for the new ALICE visitor center in SX2 | | | 2 M | | | | | | |
| ALICE | Install the new ITS and MFT cooling plants | | | | | | | | 6M | |
| ATLAS | Concolidate ATLAS complex ventilation control system to PVSS-UNICOS | | | 3 M | | | | | 35 W | |
| ATLAS | ATLAS Thermosiphon Commissioning | 12 M | 2 M | | | | | | | |
| ATLAS | UX15 Ventilation upgrade to reduce vertical stratification | | | | | | | | ?? | |

- ALICE: preparatory projects to allow Alice upgrade works in LS2, searching for computer center cooling solution…
- ATLAS: upgrade of the ventilation of the cavern UX15

# CMS & LHCb

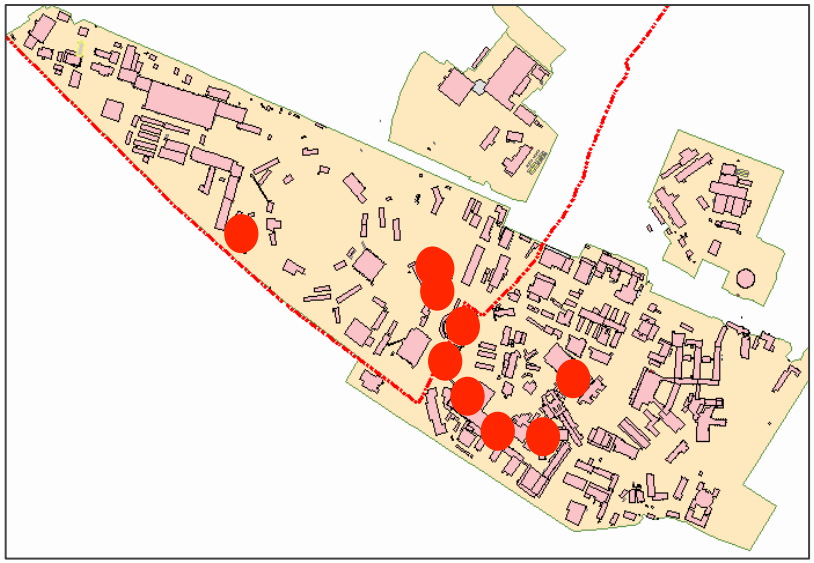
Consolidation
New Project
Upgrade

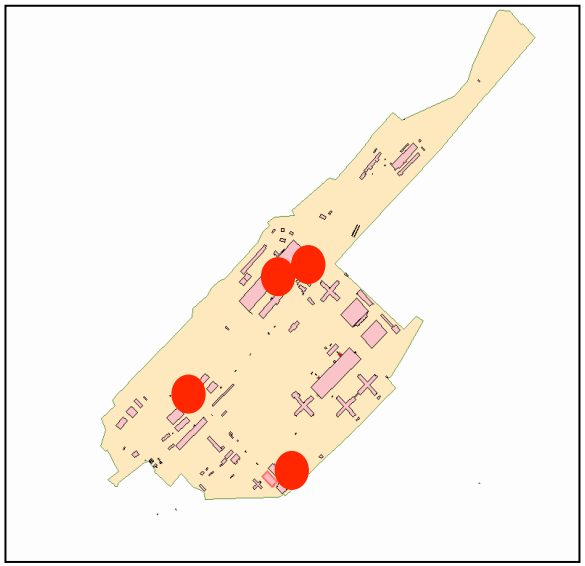
| Zone | Main Activity | 2015 | YETS 2015-2016 | 2016 | EYETS 2016-2017 | 2017 | YETS 2017-2018 | 2018 | LS2 2019-2020 | 2021 |
|---|---|---|---|---|---|---|---|---|---|---|
| CMS | Consolidate SUX5 cooling control system to PVSS-UNICOS | | 4 W | | | | | | | |
| CMS | Concolidate CMS complex ventilation control system to PVSS-UNICOS | | | | | | | | 30 W | |
| CMS | CMS Control Room HVAC upgrade | | | | | | | | 4 M | |
| CMS | CMS improvement of Chilled water production + 1.5 MW | | | | | | | | ?? | ?? |
| LHCb | LHCb New Assembly Hall | 2 M | | | | | | | | |
| LHCb | New monophase cooling system for SiPM detector | | | | | | | 8 M | | |
| LHCb | Install a new cooling system for the new data centre for LHCb | | 2 M | | | | | | | |
| LHCb | Install primary cooling system for new CO2 detector cooling | | | | 4 M | | | | | |
| LHCb | Upgrade the Rich 1&2 cooling system | | | | | | | | 8 M | |

- CMS: last week announced very large detector cooling revision (+1.5 MW) ready for LS3 -> to be studied.
- LHCb workshop on 20/2/2015 -> searching cooling solution for large computer center; large detector evolution -> changes in the Detector Cooling.

Activity overview is over, let's see general issues…

# …a solution for ASBESTOS removal





- Second phase of the chilled water piping consolidation PS+NA
  - During LS1 ➔ PS ventilation, PS chilled water piping, NA chilled water piping
- Consolidation of PSB: old concrete + asbestos air handling units
- PS tunnel: 60 years old ventilation ducts over the machine
- …a number of medium-small intervention will require asbestos removal

**ASBESTOS**: CV suggests to set-up a large “CERN asbestos removal contract” to cope with all, even large, asbestos removal activities at CERN.

# Test & Commissioning

- Given the quantity of CV systems concerned and the important modifications to be performed, the test & commissioning of each CV plant will be a **major activity** requiring several days per plant.
- In addition, **each equipment Group** will need to test & commission his equipment before considering his work completed.
- During each of these steps the effort required to CV team is not negligible (drain, fill up, balancing of circuits…) and, **only after** their successful completion, CERN can enter the commissioning phase of each accelerator.

Please enter all test details in PLAN…

# Main External Contributions

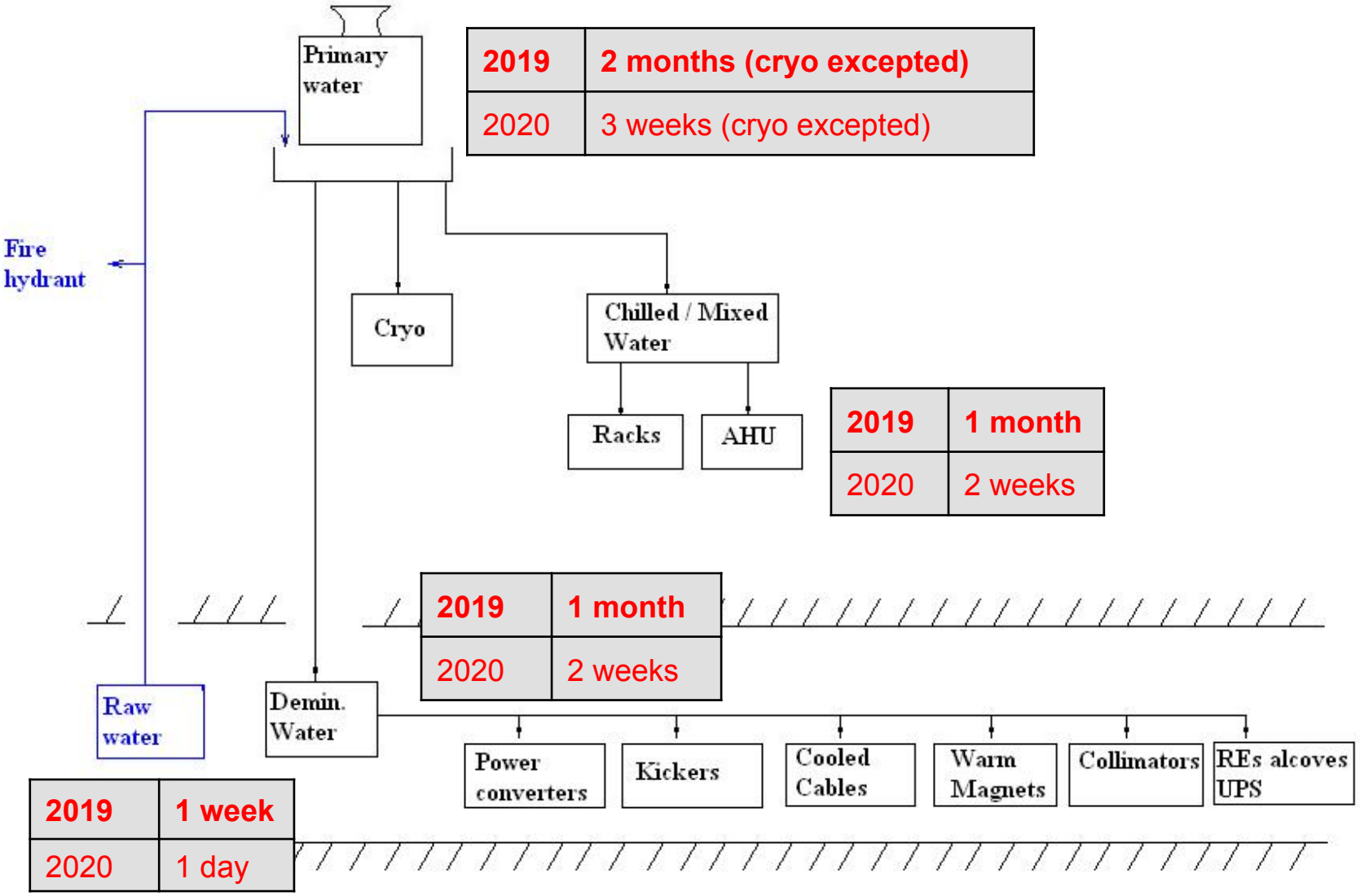
- **Civil engineering**: meeting CV-SE on 9th September 2015 to share the list of larges request of contribution:
  - New cooling towers of Pt18 + AD;
  - Roofs consolidation (CCC, 237, 351, etc.);
  - A number of asbestos removal worksites.
- **EN/EL**:
  - Provide the needed power for the different installations, supply of cubicles;
  - The plan tool will be used to announce the CV requests for each project.
- **Radio Protection**:
  - Assess the activation of existing equipment to be dismantled;
  - ALARA Level 3 analysis will be probably required for the PSB projects;
  - Radioactive waste production is foreseen in the PSB, PS and NA areas.
- **Pipe welds x-ray test**:
  - 95% of contractors requested Qualitech intervention: all ok in LS1 but risk of one single point of failure. Shall we have two contractors there?
- **Safety coordination**: very good collaboration and valuable help during LS1
  - Difficult to estimate the workload now.
- **Transport**: waste handling during CV systems demolishing

# Maintenance and Operation

- The work to perform for the maintenance of existing installation is expected be similar as LS1:
  - Mechanical revision (30.000 of working hours) of motors, pumps and fans;
  - Cleaning of heat exchangers;
  - Repairs of the cooling towers;
  - Re-qualification of vessels;
  - Replacement of the desiccant of the air dryers;
  - Calibration of the sensors;
  - Chiller replacement / mechanical revision
- As the program is similar LS1 the workload expected should be about 120% of a “run year”;
- The new cryo-back-up cooling tower (installed in LS1) will limit the unavailability impact of the LHC cooling tower during maintenance (2 months each)

This will imply unavailability of installations…

# CV Installations' Unavailability – Any Complex




| 2019 | 2 months (cryo excepted) |
|---|---|
| 2020 | 3 weeks (cryo excepted) |

| 2019 | 1 month |
|---|---|
| 2020 | 2 weeks |

| 2019 | 1 month |
|---|---|
| 2020 | 2 weeks |

| 2019 | 1 week |
|---|---|
| 2020 | 1 day |

# M&O Organisation

- During LS1 the requests of CV operation from other groups implied a sensible engagement of manpower for the entire duration of the LS1:

  We need to anticipate it → sharp requests in Plan!!

- The request to provide mobile temporary installation to re-establish the service during maintenance shall be limited;
- CV recommends to reduce as much as possible the **systems in operation** to allow to transfer operation resources to works and projects.

# Conclusions

- The “shopping list” of possible CV projects is extremely large: the **manpower** will be the critical resource of LS2 for CV, if possible even more critical than during LS1; new PLs should arrive well in advance (beginning 2017 at latest).
- CV recommends to focus consolidation activities in a **defined zone** instead of dispersing forces in a number of zones;
- CV **consolidation strategy**: LS1-LHC, LS2-PS, LS3-SPS.
- **Asbestos** removal would need a general CERN coordination for all projects.
- Large incertitude in cost and planning related to dismantling of **asbestos & radioactive material**.
- **PLAN PLAN PLAN !!!**

Thanks for your attention and contribution.

Any Question?