Market Survey

Technical Description
Supply of Cooling Systems During the LS2 Period (2019-2020)

Abstract
This Technical Description concerns the supply and installation of cooling systems at CERN during the Long Shutdown period number two (LS2) in 2019 and 2020. This Market Survey will be followed by several Price Enquiries and Invitations to Tender that are planned to be issued during 2018 and 2019.
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1. INTRODUCTION

1.1 CERN
CERN, the European Organization for Nuclear Research, is an intergovernmental organization comprising over 20 Member States\(^1\), with its seat in Geneva, Switzerland. Its facilities straddle the Swiss-French border [http://cern.ch/fplinks/map.html](http://cern.ch/fplinks/map.html).

CERN’s mission is to enable international collaboration in the field of high-energy particle physics research and to this end it designs, builds and operates particle accelerators and the associated experimental areas. At present, more than 11 000 scientific users from research institutes all over the world are using CERN’s installations for their experiments.

The accelerator complex at CERN is a succession of machines with increasingly higher energies. Each machine injects the beam into the next one, which takes over to bring the beam to an even higher energy, and so on. The flagship of this complex is the Large Hadron Collider (LHC) as presented on the CERN website: [http://cern.ch](http://cern.ch).

1.2 Introduction to the Engineering Department and to Cooling and Ventilation Group
The Engineering Department provides CERN with the engineering competences, infrastructure systems and technical coordination required for the design, installation, operation, maintenance and dismantling phases of the CERN accelerator complex and its experimental facilities.

The mandate of the Cooling and Ventilation group concerns the engineering studies, operation and maintenance of the cooling systems, pumping stations, air conditioning installations and fluid distribution systems for the accelerator complex including their experimental areas and special cooling systems of the accelerator detectors.

1.3 Introduction to the Long Shutdown LS2
Since the start-up of the LHC, CERN has planned several periods of accelerator shut-down. These periods allow the execution of large maintenance activities, the consolidation or the upgrade of existing systems, and the construction of new systems. Between January 2019 and March 2021 CERN has planned the second of these long periods of accelerators shutdown (LS2).

2. SCOPE OF THE SUPPLY
CERN intends to place several contracts for the design, supply and installation of cooling systems at CERN during the period of LS2 (2019-2020). CERN has defined two categories of contracts covering small and large projects.

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\(^1\) [http://home.web.cern.ch/about/member-states](http://home.web.cern.ch/about/member-states): except where stipulated otherwise, the term “Member State(s)” shall mean full member state(s) of CERN, associate member state(s) of CERN and associate member state(s) in the pre-stage of accession to membership of CERN.
2.1 Small and Large Projects

For the scope of this Market Survey we define generically as *small*, projects that have the following characteristics:
- water cooling systems in industrial premises for a flow rate up to 200 m$^3$/h;
- water cooling systems with up to 800 kW cooling power.

Similarly, we define generically as *large*, projects that have the following technical characteristics:
- water cooling systems in industrial premises for a flow rate between 200 m$^3$/h and 1200 m$^3$/h;
- skid mounted cooling systems between 800 kW and 3 MW cooling power.

2.2 Preliminary List of possible Price Enquiries and Invitations to Tender

This Market Survey will be followed by a number of Price Enquiries and Invitation to Tenders for installation activities during the LS2 (2019-2020). The following list gives an indication of the future tenders for project to be performed on the French (F) or Swiss (CH) territory of CERN:

Small projects:
- Upgrade of the pipework of CMS Experiment ECAL Detector cooling system (F);
- Upgrade of the CMS Experiment electronic rack cooling system in USC55 and UXC55 caverns (F);
- Upgrade of compressed air system for CMS Experiment (F);
- Construction of four portable cooling system for CMS Experiment ECAL Detector test benches (F);
- Supply and installation of the new cooling system for the new SPS beam dump (F);
- Supply and installation of a low dew point compressed air system for LHCb Detector (F).

Large projects:
- Supply and installation of a heat recovery system at LHC point eight (F) and point two (F);
- Upgrade of the primary cooling circuit of CMS Experiment cooling architecture (F);
- Supply and installation of the low temperature cooling system for the CMS Experiment at point five of the LHC (F);
- Installation of firefighting water system in SPS access shafts and tunnel (F);
- Consolidation of the water cooling distribution in the TT2 tunnel in building 269 (CH);
- Consolidation of the chilled water distribution network in the PS accelerator tunnel (CH);
- Installation of the cooling system for the cryogenic system at point four of the LHC (F).

This list is given for information only.

2.3 Deliverables and Activities

Depending on the project the Supply shall include the following deliverables and activities:
- Delivery of the detailed design file for construction;
- Delivery of the technical documentation of the components (TDC) for CERN approval before purchase;
- Purchase of the components;
- Assembly of pre-fabricated systems at contractor premises, if so requested;
- Test at the contractor premises witnessed by a CERN representative, if so requested;
• Packing of the Supply;
• Shipping to CERN, if so requested;
• Transport of all materials and tooling required for the proper installation, commissioning on the CERN site;
• Dismantling and decommissioning of existing installation / system, if so requested;
• Installation on the CERN site;
• Testing;
• Delivery of the test file;
• Commissioning;
• Delivery of the as-build documentation.
• Training of CERN personnel, if so requested;
• Supply of critical spare parts, if so requested;
• Corrective maintenance during the warranty period including spare parts.

2.4 Equipment and Services Made Available by CERN

CERN will make available the following equipment and services:
• Electrical power supply;
• Vertical handling services;
• PLC control software.

3. REQUIREMENTS

3.1 Technical Requirements

The supply must comply with the following parameters and conditions:
• Prefabricated cooling towers from 500 kW to 3 MW;
• Raw or demineralized water pumps size can vary from 1 to 1200 m³/h each and from 2 to 25 bar pressure head;
• Stainless steel or black steel pipes size can vary from 15 to 400 nominal diameter (DN) and from 10 to 25 bar nominal pressure (PN) rating;
• The cooling system shall be equipped with manual, electrical or pneumatic actuated section valves or control valves or pressure regulators;
• Sensors shall be installed to indicate, or remotely control and monitor temperature, pressure, flow, conductivity, and other physical quantities;
• Electrical power and control cubicles shall be delivered, installed, cabled and terminated to the field instruments (sensors and actuators);
• The PLC code shall be supplied and installed in conformity with CERN standards. It will be tested by CERN;
• Components shall be selected in accordance with the CERN Hydraulic Technical Prescriptions annexed to the invitation to tender documents.
4. PERFORMANCE OF THE CONTRACT

4.1 Delivery Schedule

The design, supply and installation contracts are scheduled to be awarded in the second half of 2018 and during the entire 2019, following the Price Enquiries and Invitations to Tender to be issued as of April 2018.

The delivery, installation and commissioning schedule for each Supply must be strictly respected as it will be part of the general coordination schedule of activities of the LS2. The relevant detailed schedule will be annexed to each specific Invitation to Tender. A typical schedule will respect the following milestones:

Table 1: Typical project milestones

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Milestone number</th>
<th>Delay</th>
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</thead>
<tbody>
<tr>
<td>Award of the contract</td>
<td>T0</td>
<td></td>
</tr>
<tr>
<td>Delivery of the detailed design file</td>
<td>T1</td>
<td>= T0 + four weeks</td>
</tr>
<tr>
<td>Start on-site work</td>
<td>T2</td>
<td>Within T0 + ten weeks</td>
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<tr>
<td>Submission of documentation on control system (final version of P&amp;ID, electrical scheme, and I/O list)</td>
<td>T3</td>
<td>Within T0 + 27 weeks</td>
</tr>
<tr>
<td>Completion of on-site installation</td>
<td>T4</td>
<td>Within T0 + 34 weeks</td>
</tr>
<tr>
<td>End of commissioning</td>
<td>T5</td>
<td>Within T0 + 37 weeks</td>
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<tr>
<td>Acceptance and provision of technical and safety documentation</td>
<td>T6</td>
<td>Within T0 + 39 weeks</td>
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4.2 Working on the CERN Site

The contractor shall take into account and implement the rules and provisions defined in document entitled Working on the CERN Site:

https://edms.cern.ch/file/1155899/

Depending on the projects, the contractor shall perform the contracts on the French part of the CERN site, on the Swiss part of the CERN site, or both the French and Swiss parts of the CERN site. The applicable law will be stipulated in the forthcoming Invitation to Tender documents.

Particular features of the CERN site:
- Safety requirements including safety, occupational health, working conditions and environmental protection;
- Customs formalities since the installations straddle the Swiss-French border;
- Work in underground areas;
- Work in radiation areas;
- Two-shift operation, if requested for planning reasons;
- Extent of the territory and distances between sites.
5. CONTACT PERSONS AT CERN

### For Technical Matters

<table>
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