



Opportunitá per l'industria nel settore dei convertitori di potenza per gli acceleratori di particelle del CERN

Michele Martino, on behalf of TE-EPC

Electrical Power Converter Group

The TE-EPC group is in charge of the design, development, procurement, construction, installation, operation and maintenance of electrical power systems for all accelerators, transfer lines, experimental areas and tests facilities at CERN.

This includes:

Power converters for normal conducting and superconducting magnets

Solid state klystron modulators

Static VAR compensators

All information about the TE-EPC group can be found here:

<http://epc.web.cern.ch/>

Definition

Wikipedia:

A power supply is an electrical device that supplies electric power to an electrical load.

Power supplies are everywhere:

Computer, electronics, motor drives,...

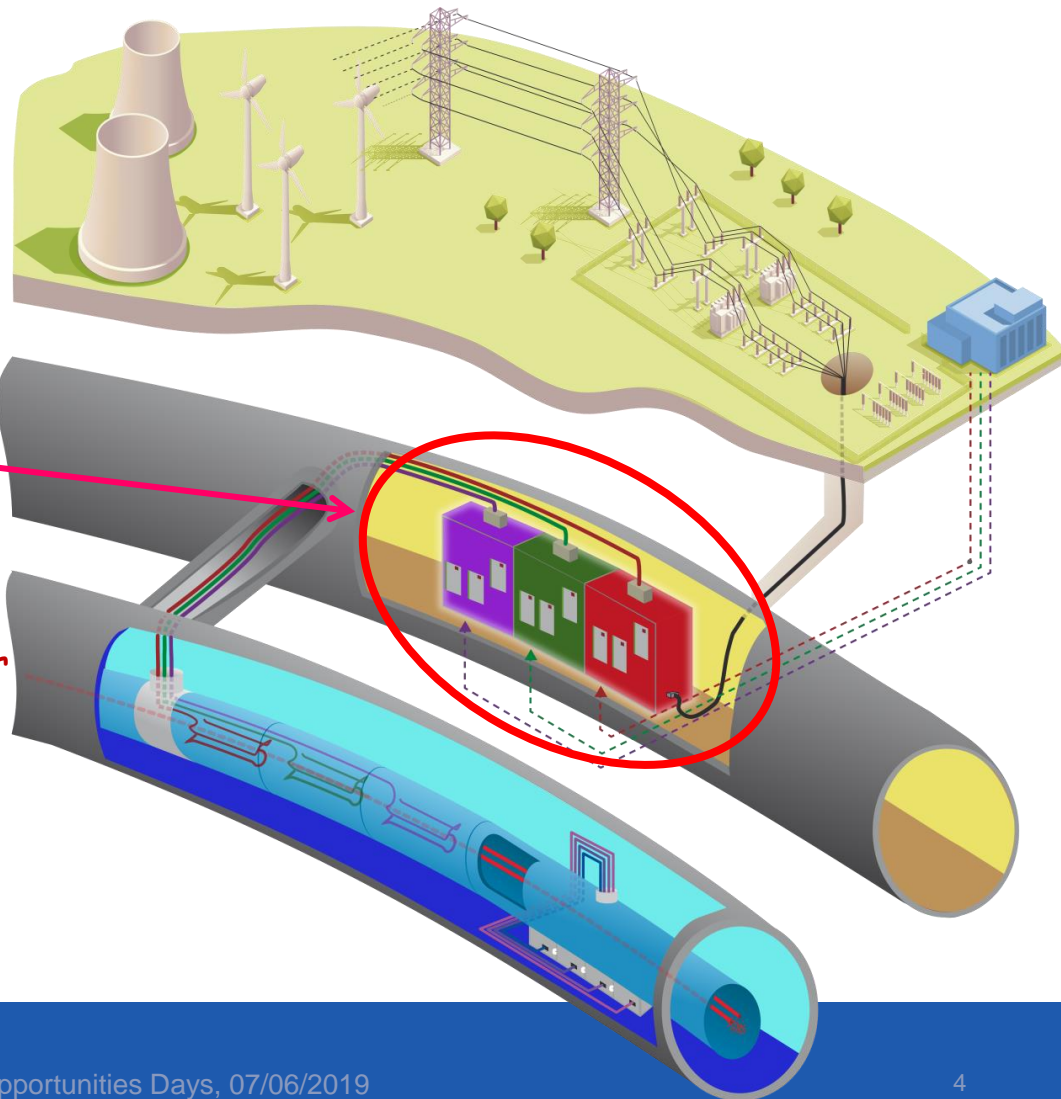
Here, the presentation covers only the very special ones for particles accelerators : **Magnet power supplies**

Power supply vs power converter

US labs uses magnet power supply

CERN accelerators uses **power converter**

CERN experiment uses power supply



Power supplies needed for:

The TE-EPC group has to deliver new power systems for CERN's projects.

HL-LHC: High Luminosity LHC

Purchasing has started in 2019

Regular operation & consolidation

Purchasing every year

Run 2				Long shutdown		Run 3			Long shutdown		Run 4	
2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
LIU: Tendering		Production		Installation								
				Tendering		Production			Installation			
				CONSO: Tendering / Production								

Type of purchasing

We have different types of purchasing:

- **Commercial based** power supplies
Mainly using commercial off-the-shelf power modules.
Integrated in EPC power racks and control architecture.
Example: COMBO
- **Build to specification** special power supplies
Power converter specified by CERN.
Design and production by industries.
Example : COBALT
- **Build to print** based on manufacturing folder
Design by CERN and prototyping made at CERN.
Production done by industries.
Examples: CANCUN, MACAO, CUTE, COMET, RF25kV, SIRIUS



Type of purchasing

We have a list of Italian companies which are in relation with us to provide **special power supplies**: EEI, OCEM, NIDEC ASI, DANA.

We also buy **all types of components** used in power supplies, such as : **power semiconductors and magnetics, racks, capacitors, DCCTs, etc.**
analog/digital electronics (centralized by a different service at CERN though)

We have a list (not exhaustive) of Italian suppliers for this kind of **components**:

ICAR (**capacitors**),

TMC (**transformers**), Trafomec (**transformers, medium frequency chokes**), Italcoil (**high frequency transformers**), HPS (**magnetics, still on the market?**)

POSEICO (**semiconductors**),

TELEMA (**resistors**),

MB elettronica (**power stacks**),

CAEN ELS (**DCCTs**),

ENERLUX (**AC capacitors banks for SVC**),

Search of new suppliers

We are looking for companies for the production/assembly of **CERN designed** power supplies (**build to print**).

Type of power supplies to be produced:

Low power:

- CUTE, typical quantity from 50 to 150 units

Medium Power:

- SIRIUS, typical quantity from 50 to 150 units
- COMET, typical quantity from 5 to 20 units

Unfortunately, sometimes small series. **Non-recurrent business.**

Type of companies :

subcontractors of UPS manufacturers, or **electrical cabinet** assembly specialist, or **PCB** manufacturer.



Search of new suppliers for HL-LHC

All HL-LHC power supplies will be **low voltage** power converters **designed by CERN**

They will need production/assembly suppliers (**build to print**).

Very high current:

- HL-LHC18kA-10V ~ 5 units
- HL-LHC14kA-08V ~ 10 units

High current:

- HL-LHC2kA-10V ~ 40 units

Medium current:

- HL-LHC600A-10V ~ 20 units

Low current:

- R2E-HL-LHC120A-10V ~ 100 units
- R2E-HL-LHC60A-10V ~ 400 units

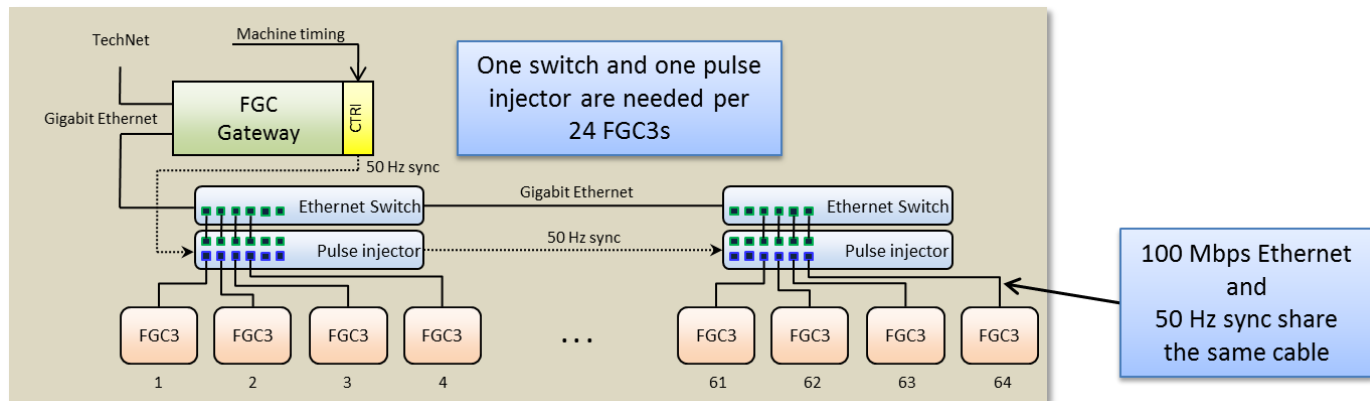
FGC: CERN power supply control

Particles accelerators need special control system.

The power supplies need to be all synchronized and with a **high-precision** current control (**sub ppm to few tens ppm**).

CERN has developed a special control system for magnet power supplies, called **FGC** (Function Generator and Controller, currently **FGC3.1**)

With our **Transfer Technology** group, we are looking for partners in this field.



Special purchasing

Present tendering:

DR-7694137/TE
DR-7688193/TE
DR-7651277/TE
DR-7637099/TE

SMQ Filter Capacitors
TE-EPC Transformer Refurbish
18kA and 14kA DCCTs for HL-LHC
2kA DCCTs for HL-LHC

Purchasing

All our purchasing is done through our procurement service (see C. Carayon talk at 11h)

We have a list of companies able to deliver different products and we are **open** to work **with new ones**.

We are looking for companies able to **assemble power supplies** from a **manufacturing folder**.

We are open for **technology transfer** for power supply **control** or **license** on **manufacturing folders**.

Please contact us if you think you can provide for us:

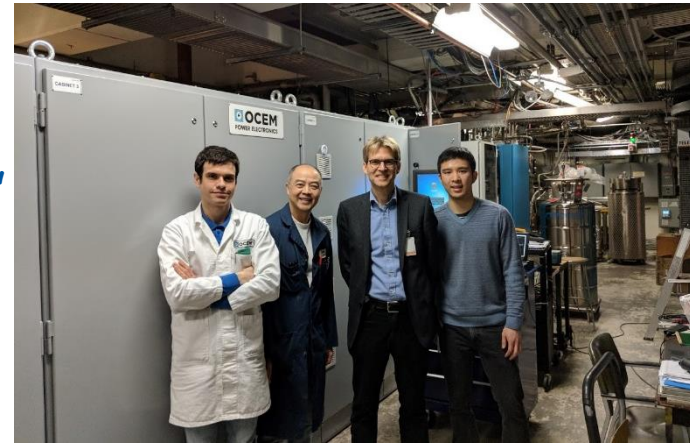
jean-paul.burnet@cern.ch

Technology Transfer: a successful case

Right after this IOD 4 years ago, OCEM contacted us for providing the control hardware/software for the new high-precision main magnet power supply (MMPS) of TRIUMF cyclotron (CANADA particle accelerator centre)

By means of the **Service Agreement KM3128 KT/TE/250P**: for the Development of a FGC3 Power Converter Controller by CERN for a 20kA-80V DC high current magnet power supply (signed in August 2016).

Successful installation of the MMPS with "ppm level" precision in April 2018 !



<https://www.triumf.ca/current-events/triumf-cyclotron%E2%80%99s-new-main-magnet-power-supply-comes-life>