

# Introduction to the LHC-CP

R. J. Lauckner

# Outline

- u Purpose of the LHC-CP and Core Team
- u Concerned Groups
- u Major Activities
  - n Scope
  - n Organization
- u Conclusions

## Purpose of the LHC-CP and Core Team

The purpose of the LHC-CP project is to coordinate the construction and commissioning of the LHC Control System. The project team will ensure that:

- u The final system meets the needs of the Users
- u There is an optimum use of the resources in the groups concerned.

### LHC-CP Core Team:

Mike Lamont SL/OP

Robin Lauckner SL/DI

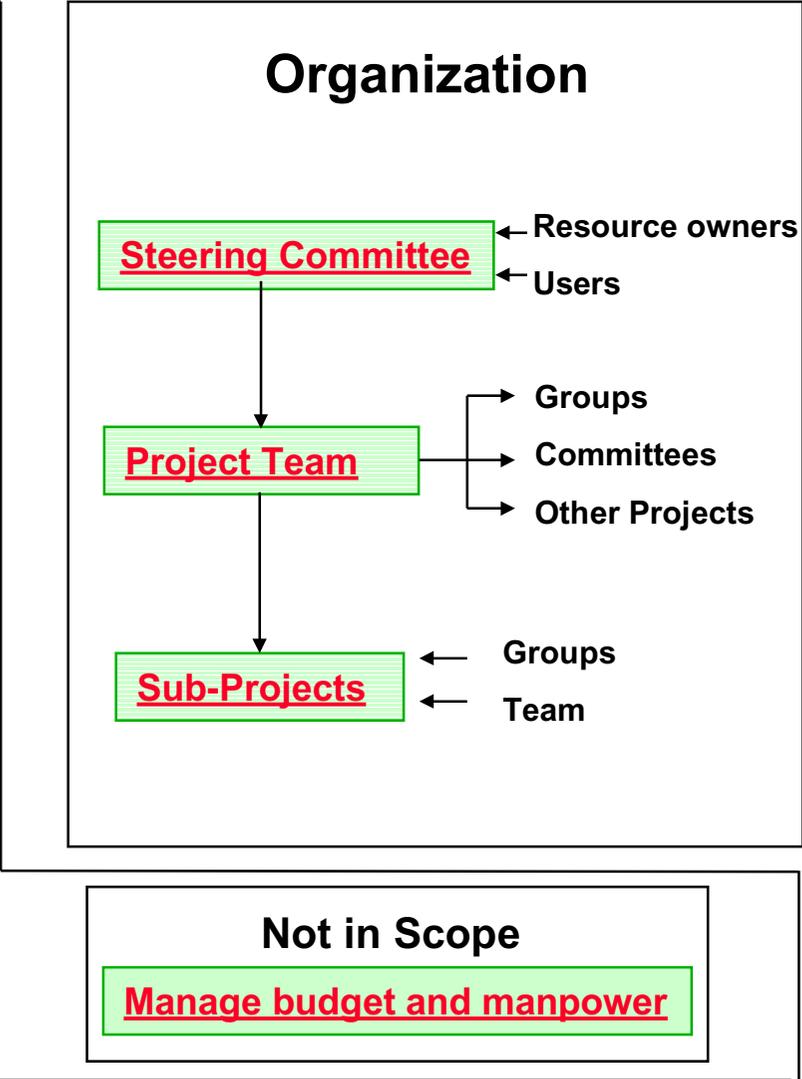
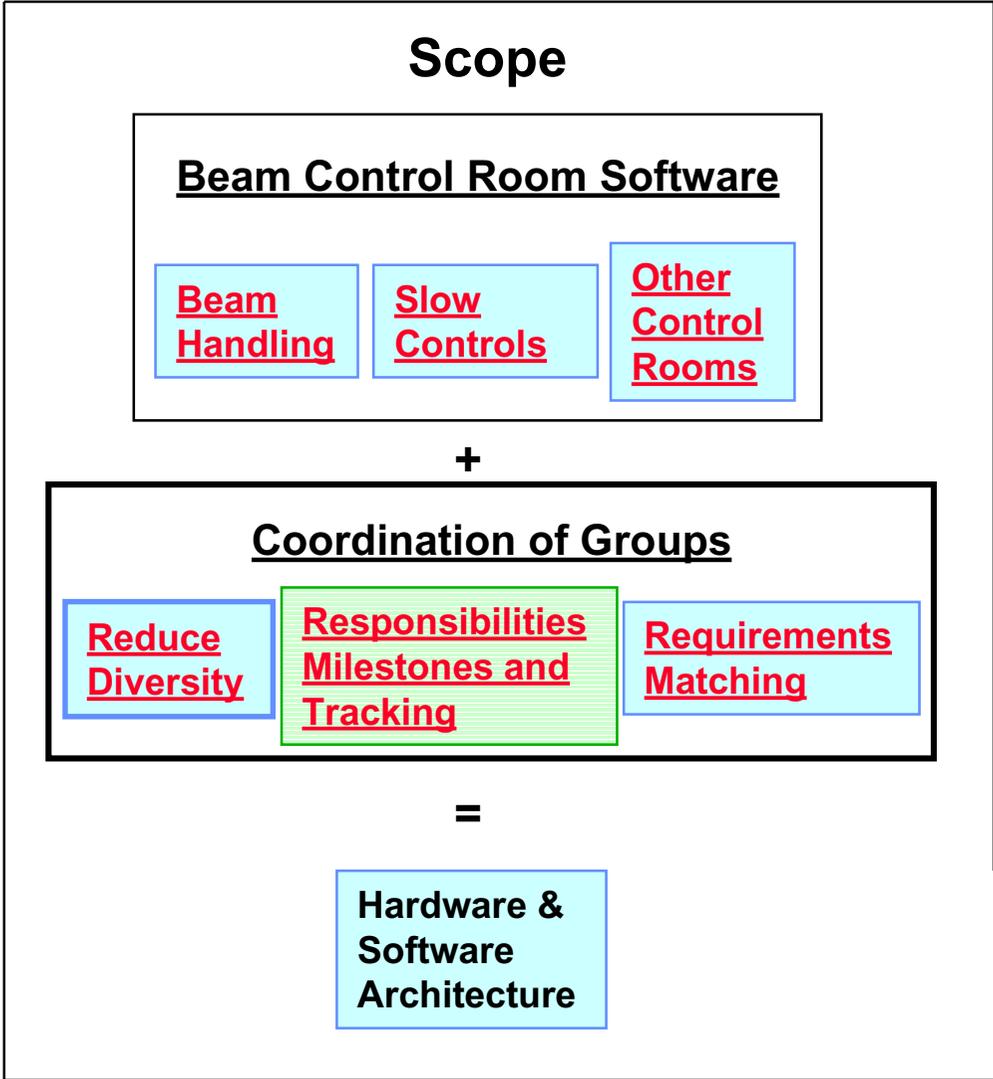
Marc Vanden Eynden SL/CO

....

# Concerned Groups

Group		Leader			Linkman	
EST-ISS	Pettersson	Thomas	74919	Martel	Pedro	73882
LHC-ACR	Erdt	Wolfgang	72113	Gayet	Philippe	72126
LHC-ECR	Passardi	Giorgio	74180	Pezzetti	Marco	74372
LHC-IAS	Rabany	Michel	75130	Rabany	Michel	75130
LHC-ICP	Siegel	Norbert	74821	Rodriguez Mateos	Felix	75217
LHC-MMS	Wyss	Carlo	73764	Wolf	Rob	74196
LHC-MTA	Sievers	Peter	76635	Walckiers	Louis	76945
LHC-VAC	Strubin	Pierre	73372	Gavaggio	Richard	72367
PS-CO	Frammery	Bertrand	74519	Di Maio	Franck	72592
SL-AP	Ruggiero	Francesco	73726	Bruning	Oliver	79161
SL-BI	Schmickler	Hermann	77078	Schmickler	Hermann	77078
SL-BT	Weisse	Eberhard	74634	Carlier	Etienne	75263
SL-CO	Charrue	Pierre	75410	Jonker	Michel	76393
SL-HRF	Linnecar	Trevor	74795	Ciapala	Edmund	75985
SL-MR	Poole	John	73252	Billen	Ronny	76409
SL-MS	Kalbrier	Willi	75278	De Rijk	Gijs	75261
SL-OP	Bailey	Roger	75191	Lamont	Mike	74806
SL-PO	Fernqvist	Gunnar	74612	King	Quentin	78473
ST-MO	Ninin	Pierre	72271	Epting	Uwe	75489

# LHC Controls Project



# Beam Handling

**Translates an operational/physics model of the machine into hardware values**  
**Enables handling of these quantities for a wide range of operational scenarios**  
**At the LHC this software must enable beam tuning despite the interlocks.**  
**The software must be flexible - SL/CO and rigorous - SL/OP and Specialists**

**LHC-CP will be involved with the specification, design and production**

**SL/OP group are users and developers, SL/AP can help with defining the operational view**

**Equipment builders must provide high level “contracts”. Additionally SL/HRF and perhaps SL/BI will be users and hopefully contribute to the development**

**SL/CO are concerned with system performance and integrity. They will provide a powerful software development environment. An important role will be the support of the same infrastructure for SLI, LTI, CNGS and the EA Upgrade. They are in charge of beam handling for SPS and hope to share development.**

**PS/CO are involved in timing and integrating beam production process**



# Slow Controls

**Covers the none beam-physics aspects of the control room software.**  
**Connected to the activities in the Technical and Cryogenic Control Rooms.**  
**“Operation without Beam” a new feature for the daily LHC operation involving: cryogenics, vacuum, magnet protection, interlocks and powering.**  
**“Operation with Beam” will also involve Services more closely**  
**Also addresses Post-Mortem, Alarms, Beam Statistics, ...**

**LHC-CP will be involved with the specification, design and production.**

**SL/OP are concerned with operation without beam and the continuation of the Use Case work involving Equipment specialists reported at the COOP Forum.**

**Critical interlocks must be dedicated however post-mortem diagnostics will rely on the controls system. Time stamping must be consistent across all systems.**

**SL/MR expect to be involved in ensuring the transparency for the INB tracing: irradiation history, performance and operational conditions. They are also the SL group with a section for database expertise.**



## Other Control Rooms

**Operation of the LHC is expected to involve much tighter coupling between the beam systems and the services systems.**

**The responsibilities of the PCR operators must be defined before building the hardware and software to carry out that job and before defining the interfaces to the software used in the other control rooms.**

**The location of the control rooms is not within the scope of the project, this is a operations and support issue which concerns the operations groups and the controls group(s).**

**Other control rooms include SPS, Experiments, Cryogenics, Technical Control Room (TCR) and PS Control Room (MCR).**

**LHC-CP will initiate the definition of the responsibilities concerning the operation of the LHC machine and it's services.**

**There is already some technical activity in this area: LDIWG are preparing a list of information to be exchanged and SL & PS are looking at a new Middleware for accelerator control which might be extended if appropriate.**



# Reduce Diversity

**A major motivation for this project is to make the best uses of the resources, spread across many groups, available to build and support the Control System.**

**Reducing diversity will also make the system more coherent and thus improve the performance.**

**Diversity should be avoided at all levels of the system, today several areas are being addressed:**

- u turnkey control systems (DCS) by LHC-CP with ST/MO, LHC/IAS and SL/CO**
- u front ends built from industrial components by LHC/IAS and SL/CO (and PS?)**
- u “traditional front ends” by SL/CO and SL Groups**
- u Other areas need attention:**
- u Services in the Middleware and RT channels?**
- u High End Interfaces to Equipment - Contracts, will SPS = LHC?**
- u Application environment - are Enterprise Beans the answer**



# Responsibilities, Milestones and Tracking

**A major motivation for this project is to make the best uses of the resources, spread across many groups, available to build and support the Control System.**

**A few major milestones - String 2, Sector Test, Commissioning is not sufficient to manage the project.**

**The LHC-CP will identify responsibilities and for all components of the system and track their development.**

**The major intermediate milestone will be the Sector Test. This is an opportunity to perform thorough system testing so that “operation without beam” and a “cold check-out” can be performed and problems cleared out before commissioning.**

**Hardware commissioning promises to be a major factor in the overall commissioning [R.Schmidt, LHC Days Villars 2000]. Beam control during the sector test seems less important.**

**Will TI8 be the first application of the LHC control system, an extension of the SPS or a hybrid?**

**Detailed planning difficult without technical strategies - “Gas” phase!**



# Requirements Matching

**A major motivation for this project is to ensure that the final system meets the needs of the Users.**

**This can only be achieved by developing the specification of the hardware and software architecture of the control system based on a good understanding of the activities to operate and develop the machine.**

**Clearly some flexibility is required!**

**The SL/OP and the SL/AP groups must be involved. However the LHC presents unique challenges therefore the knowledge and experience of the machine designers and builders is also required.**

**Not much has been done in this area**

- u A DEWG sub-group RECCS is looking at Power Converter Controls**
- u Some Use Cases were carried out preparing for the Forum**
- u Much remains**
- u Tuning the machine for peak luminosity performance**
- u Integrating Real Time Information into the applications ...**



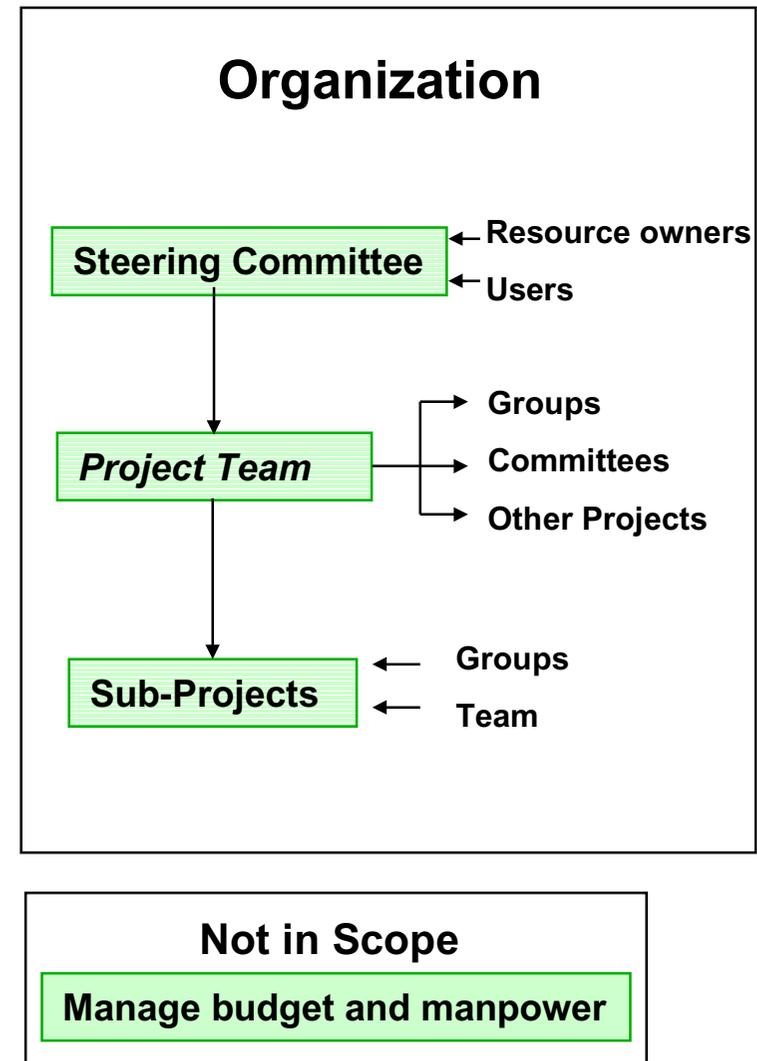
# Project Team

**The Core Team will remain small**

**In order to facilitate the dialogue with a large number of groups we have asked for a linkman from each of them.**

**The project team will be present on various committees: TCC, SLTC and eventually hardware and beam commissioning bodies.**

**Interfaces to other projects (SLI, LTI, CNGS, EA Upgrade) need to be defined. We have received a clear message from SL groups that because of the resource situation there must be a consistent approach to controls for all projects. These projects are also competing for the same resources in SL!**



# Steering Committee

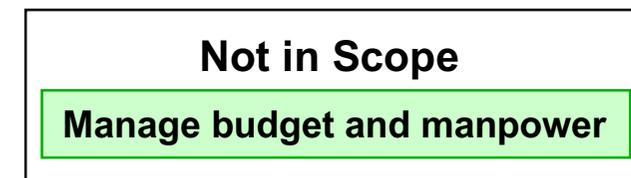
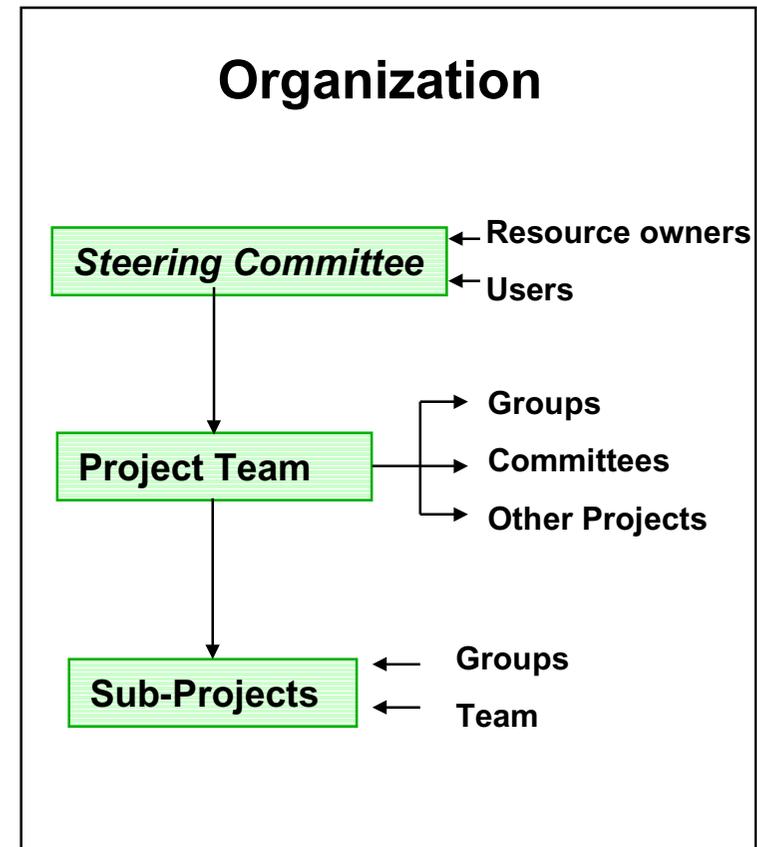
Received wisdom states that this body shall:

- u Approve Milestones and Resources
- u Determine the use of Resources
- u Monitor relation with the base organization
- u (Avoid creating a new body if possible)

In addition it should:

- u Approve the mandate
- u Monitor the Project

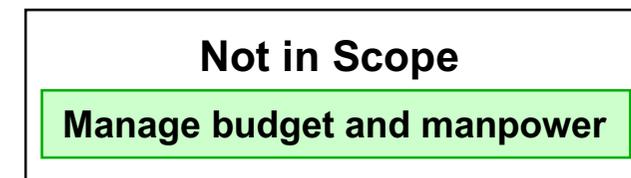
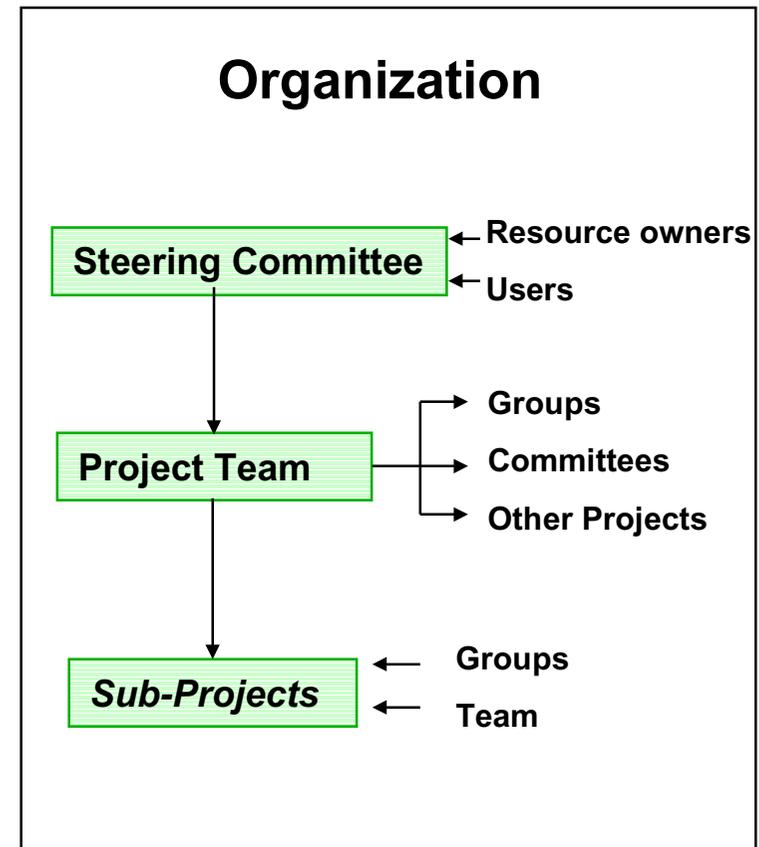
The SLTC is the right steering committee



# Sub-Projects

The core team is small and it is intended to keep it at about the current size. Sub-projects will be launched to carry out the Engineering Activities. Naturally these will have to be resourced by the groups and experts involved in addition to the core team.

An urgent subject is the specification and integration of turnkey industrial control systems, DCS. This is already being discussed between ST/MO, LHC/IAS and SL/CO under the initiative of the LHC-CP.



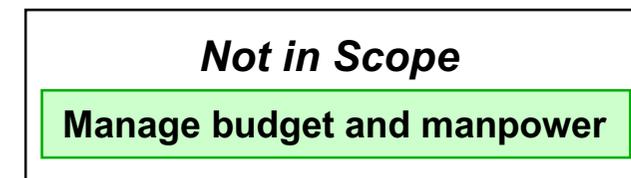
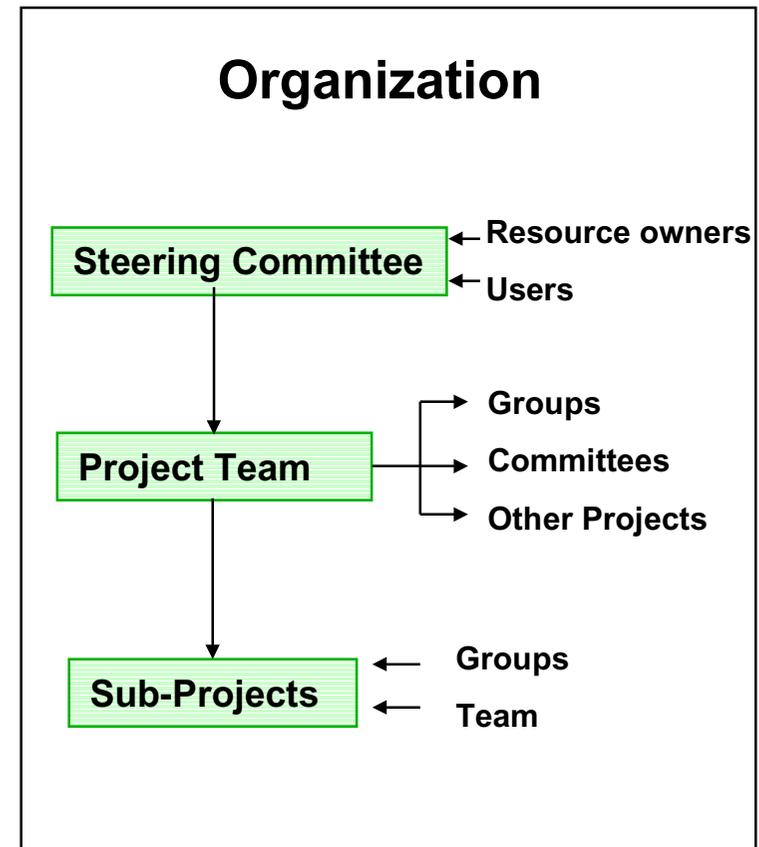
# Not in Scope

The budget for controls was allocated in 1994 and is spread over many groups. It is unrealistic to extract those budgets today.

Additionally groups retain their technical and managerial responsibilities, this includes SL/CO.

However it should be clear that a major motivation for this project arises from concern about resources.

This situation emphasizes the importance of the steering committee.



# Conclusions

- u This workshop is aimed at achieving transparency in the definition of the LHC Controls Project and to creating a common understanding of how it will work and what are the responsibilities and objectives.
- u Use it!
- u We will write up the Project Definition Report based on your feedback.

The message from management is:

- u A good control system is vital to meeting LHC performance targets.
- u Resources are critical and it is essential to achieve a coherent approach to LHC Controls.

