



# *U.S. LHC Status Update*

**T.E. Toohig**

**DOE/NSF LHC Program Office**

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# U.S. LHC Cost & Schedule Performance



	<b>Planned Complete (BCWS/BAC)</b>	<b>Actual Complete (BCWP/BAC)</b>	<b>Schedule Performance (BCWP/BCWS)</b>
<b>U.S. ATLAS</b>	<b>40%</b>	<b>38%</b>	<b>96%</b>
<b>U.S. CMS</b>	<b>59%</b>	<b>52%</b>	<b>88%</b>
<b>U.S. LHC Accelerator</b>	<b>60%</b>	<b>55%</b>	<b>92%</b>

	<b>Total Project Cost (TPC)</b>	<b>Budget at Completion (BAC)</b>	<b>Contingency</b>	<b>Budgeted Cost of Work Performed (BCWP)</b>	<b>Remaining Work to be Performed (BAC-BCWP)</b>	<b>Contingency/ (BAC-BCWP)</b>
<b>US ATLAS</b>	<b>163,750</b>	129,002	<b>34,748</b>	49,287	79,715	<b>44%</b>
<b>US CMS</b>	<b>167,250</b>	135,368	<b>31,882</b>	69,869	65,499	<b>49%</b>
<b>US Accelerator</b>	<b>110,000</b>	96,655	<b>13,345</b>	53,123	43,532	<b>31%</b>



# *U.S. LHC Accelerator Deliverables*



**Prototype quadrupole on  
cryogenic test stand at FNAL**

**\*{ $F = 7.6$  in.,  $L = 32.3$  in.,  $m = 322$  lbs.}**

**NbTi billets at Wah Chang  
(CERN purchase in U.S.)\***





# *U.S. ATLAS Deliverables*



**U.S. ATLAS – Tile Calorimeter  
(ANL/U.Ill/U.Chi)**

## **ATLAS Common Projects – LAr Cryostat (BNL Responsibility)**





# U.S. CMS Deliverables



**U.S. CMS – HCAL Barrel  
(Fermilab)**

## **Common Project– Endcap Muon (U. Wisc. responsibility)**





# LHC Revised Installation Scenario



## LHC Draft Schedule

09 February 2001

### Joint meeting LHC- Machine and Detectors

<u>Date</u>	<u>Activity</u>	<u>Conditions</u>
<b>Apr 1 – Sep 30, 2004</b>	<b>Octant test</b>	
<b>Mar 31, 2005</b>	<b>Last dipole delivered</b>	
<b>Dec 31, 2005</b>	<i>Ring closed and cold</i>	<b>Full access to experimental caverns</b>
<b>Jan 1– 31, 2006</b>	<b>Full machine commissioning, Beam pipes in place</b>	<b>Full access to experimental caverns</b>
<b>Feb 1-Mar 31, 2006</b>	<i>1 beam</i>	<b>Restricted access to experimental caverns</b>
<b>Apr 1-30, 2006</b>	<i>First Collisions. 4 week Pilot run</i>	<b>Luminosity: <math>5 \times 10^{32}</math> to <math>2 \times 10^{33}</math></b>
<b>May 1-Jul 31, 2006</b>	<b>Shutdown</b>	<b>Full access to experimental caverns</b>
<b>Aug 1-Feb 28, 2007</b>	<i>Physics run: 7 months</i>	<b>Luminosity: <math>=2 \times 10^{33}</math> (<math>=10 \text{ fb}^{-1}</math>)</b>
<b>Mar 1-Apr 12, 2007</b>	<b>Lead ion run, 6 weeks</b>	



# *Issues*



## **CERN**

**Funding: LHC project benefits from an additional year of European funding**

**Schedule: not final until magnet production is established in industry.**

.....

## **Summary of U.S. Position**

**Cost: manage delay to minimize impacts on U.S. deliverables without increase in total project cost**

**U.S. LHC Research Program: planning must proceed for a program consistent with U.S. commitment**



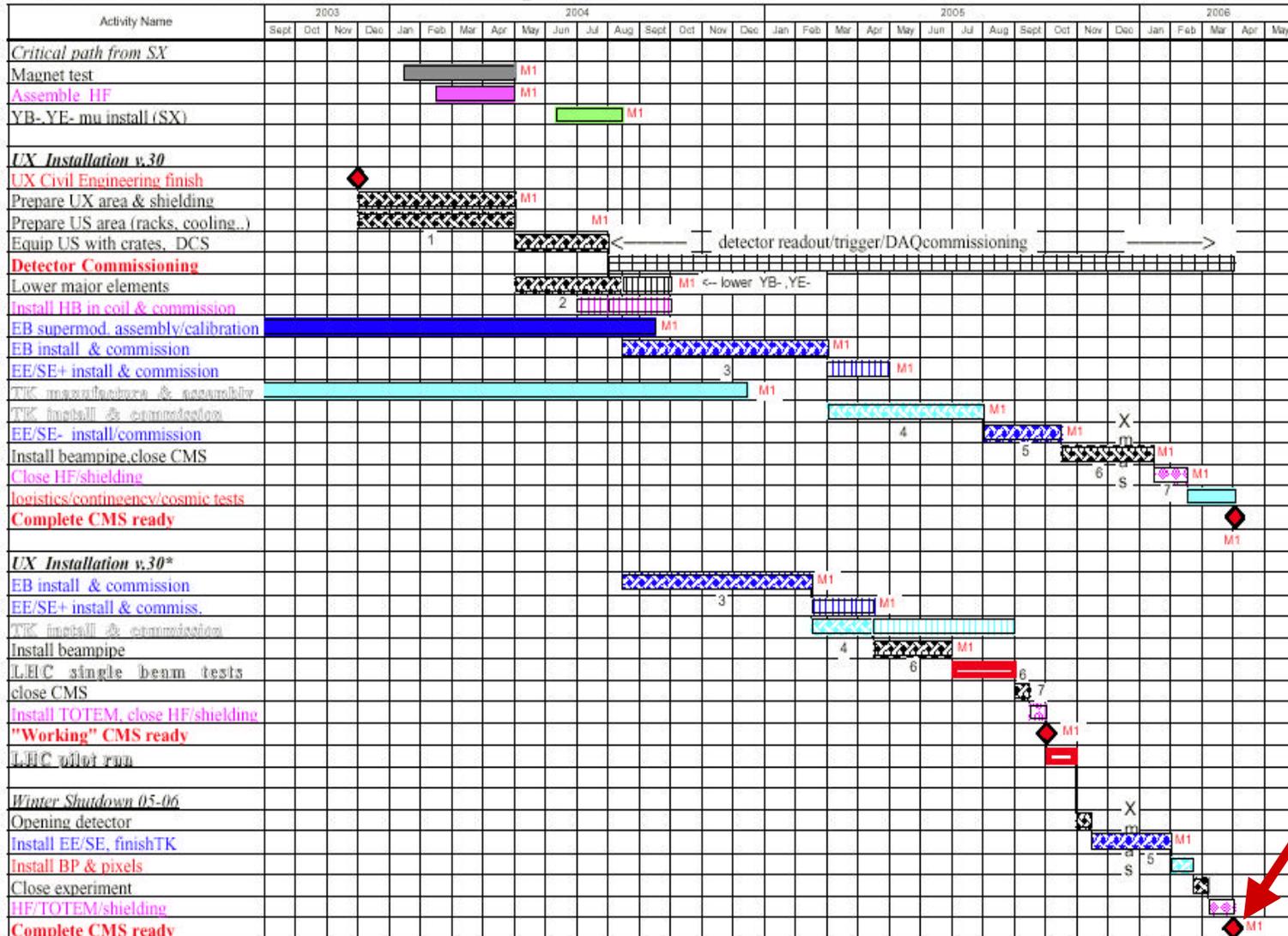
# CMS V30 UX Assembly



## CMS UX installation v30: critical phases

(v30\* : option of "working detector" in 2005)

02 Oct 2000 AB





# *Magnet Yoke Assembly*

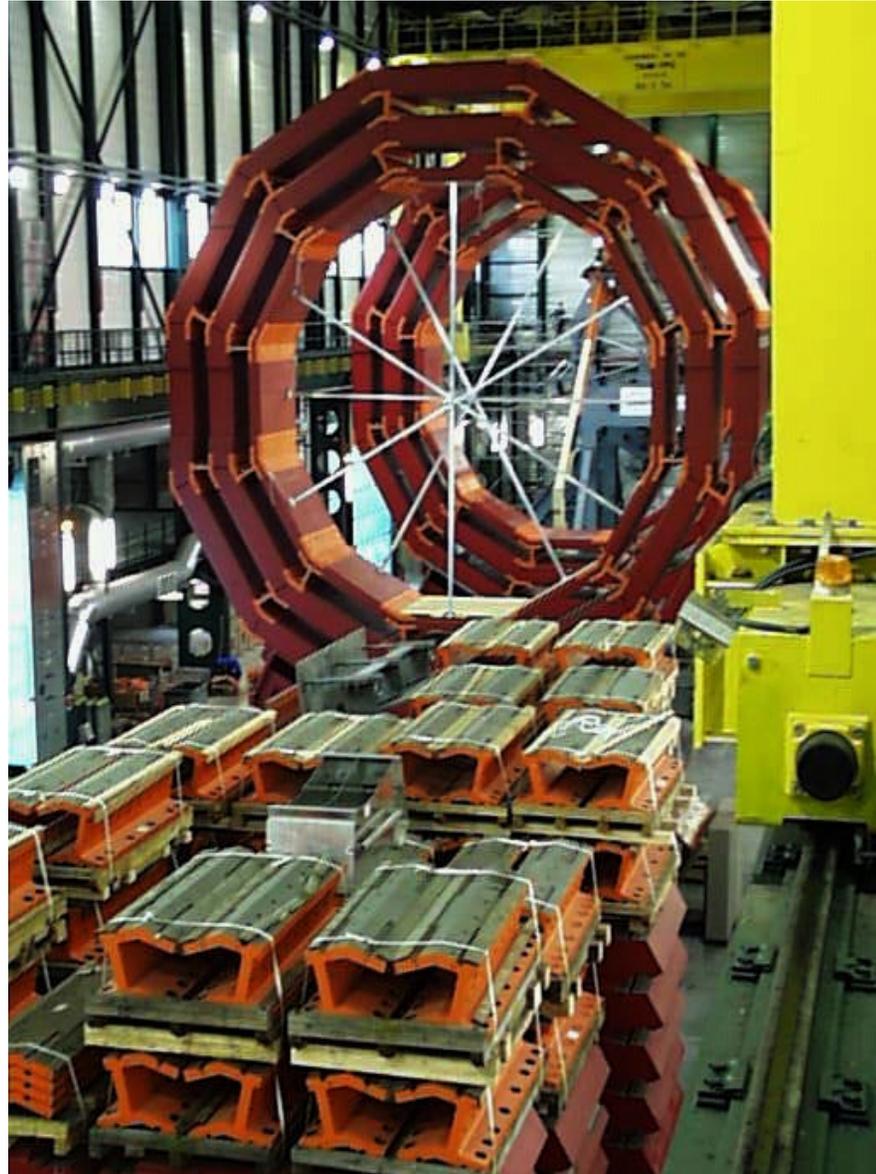


**Actual Status (16 Jan 2001) of  
the CMS barrel assembly in the  
SX5 hall:**

**Two wheels extracted:**

**YB-2 (ready for photogrammetry)  
and YB-1.**

**Assembly of central wheel YB0,  
supporting the vacuum tank, has  
started.**





## *Issues for U.S. from New Scenario*



### **U.S. LHC Project**

**Cost: minor losses due to escalation; draw on contingency**

**Pre-operations/ops: extended transition from construction project.**

### **U.S. High Energy Physics**

**Tevatron: an additional year of physics before LHC**

**LHC research program: opportunity to prepare for a strong U.S. presence in physics analysis**



# *U. S. LHC Strategy and Status*



## Status

Cost – adequate contingency (35%) at >40% complete

Schedule – on or close to baseline

## Strategy

Complete U.S. deliverables on baseline cost & schedule

## Challenges

Schedule: >interfaces between U.S. and non-U.S. activities  
>extended pre-operations period

Funding: will require stable long term funding, pre-ops & ops, at approximately the current level of support for the construction project.



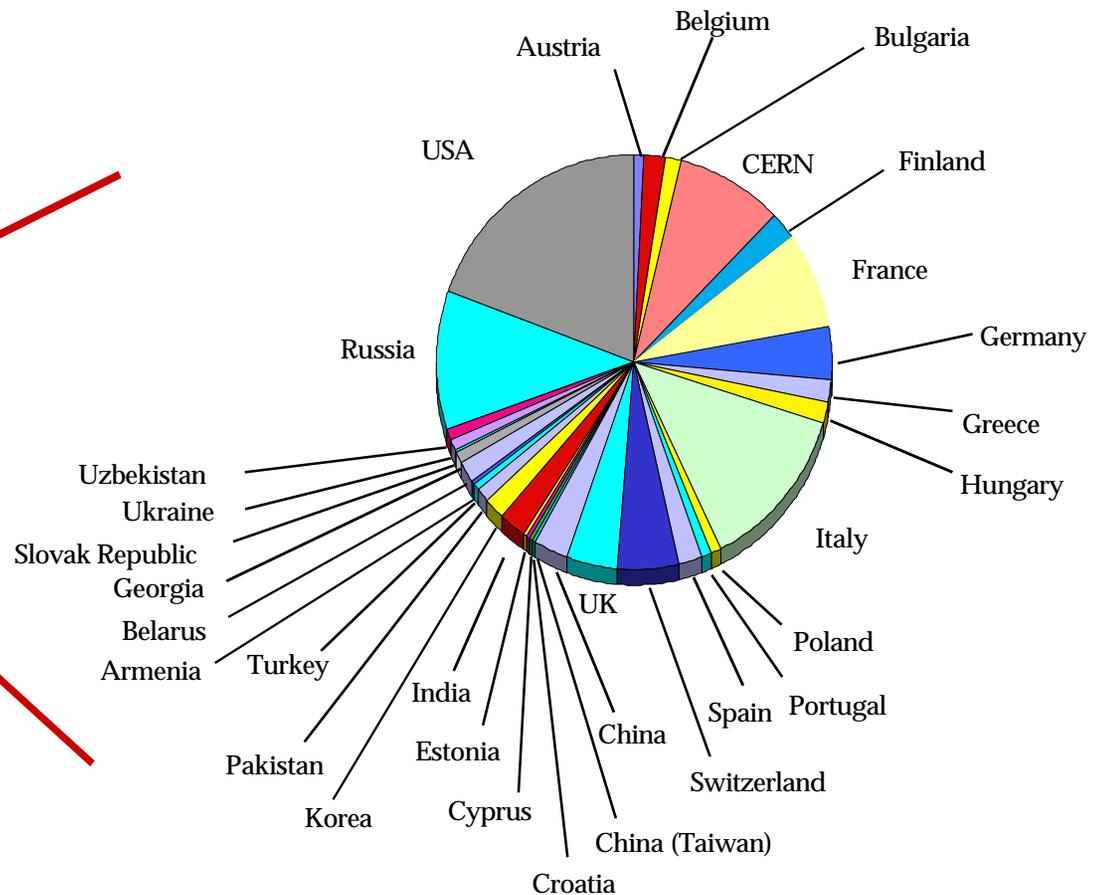
# Scope of U.S. Involvement (CMS Collaboration)



	Number of Laboratories
Member States	58
Non-Member States	50
USA	36
Total	144

	Number of Scientists
Member States	1010
Non-Member States	448
USA	351
Total	1809

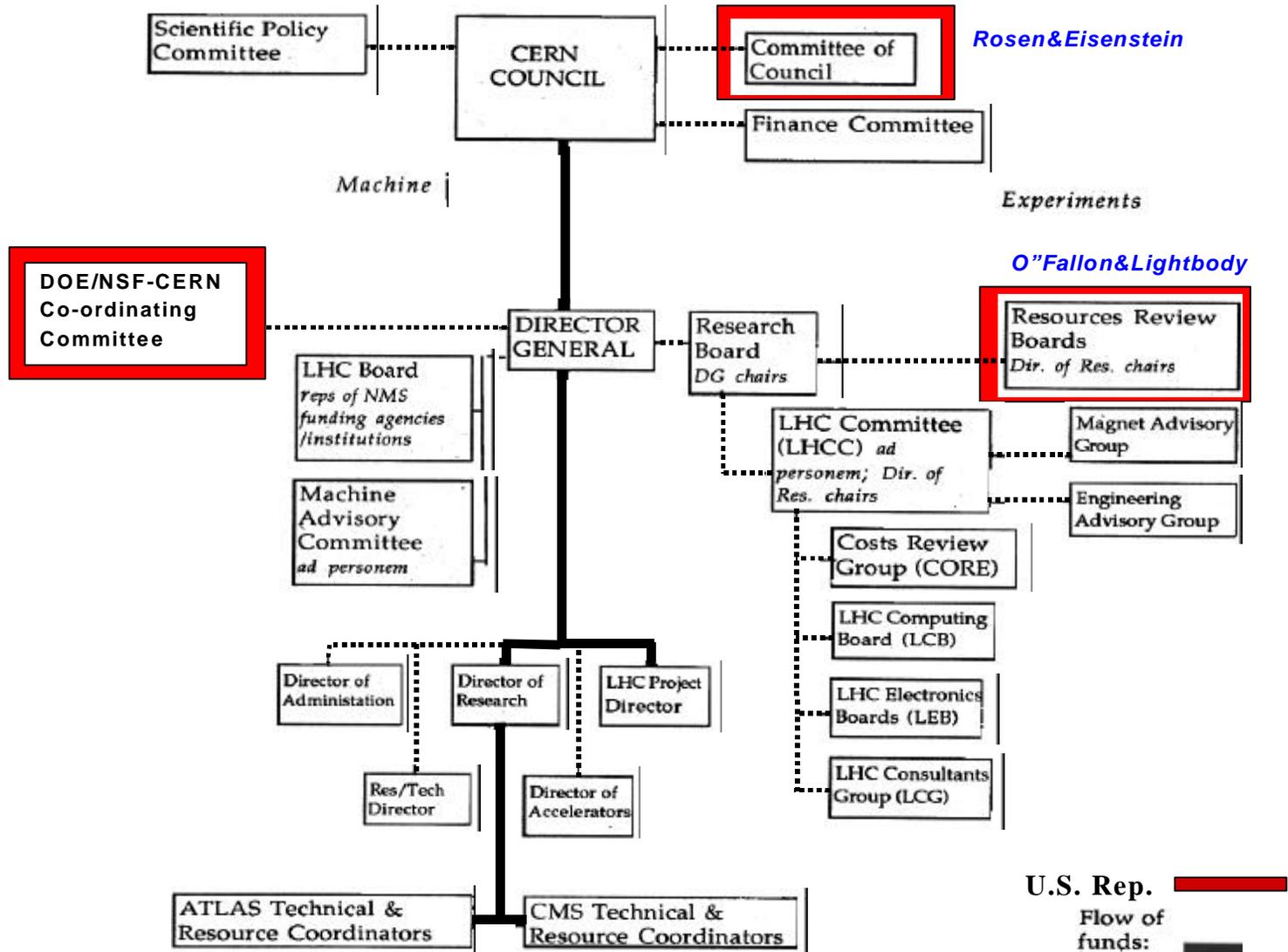
Associated Institutes	
Number of Scientists	36
Number of Laboratories	5



**1809 Physicists and Engineers**  
**31 Countries**  
**144 Institutions**



# U.S. Agencies/CERN Contact Points

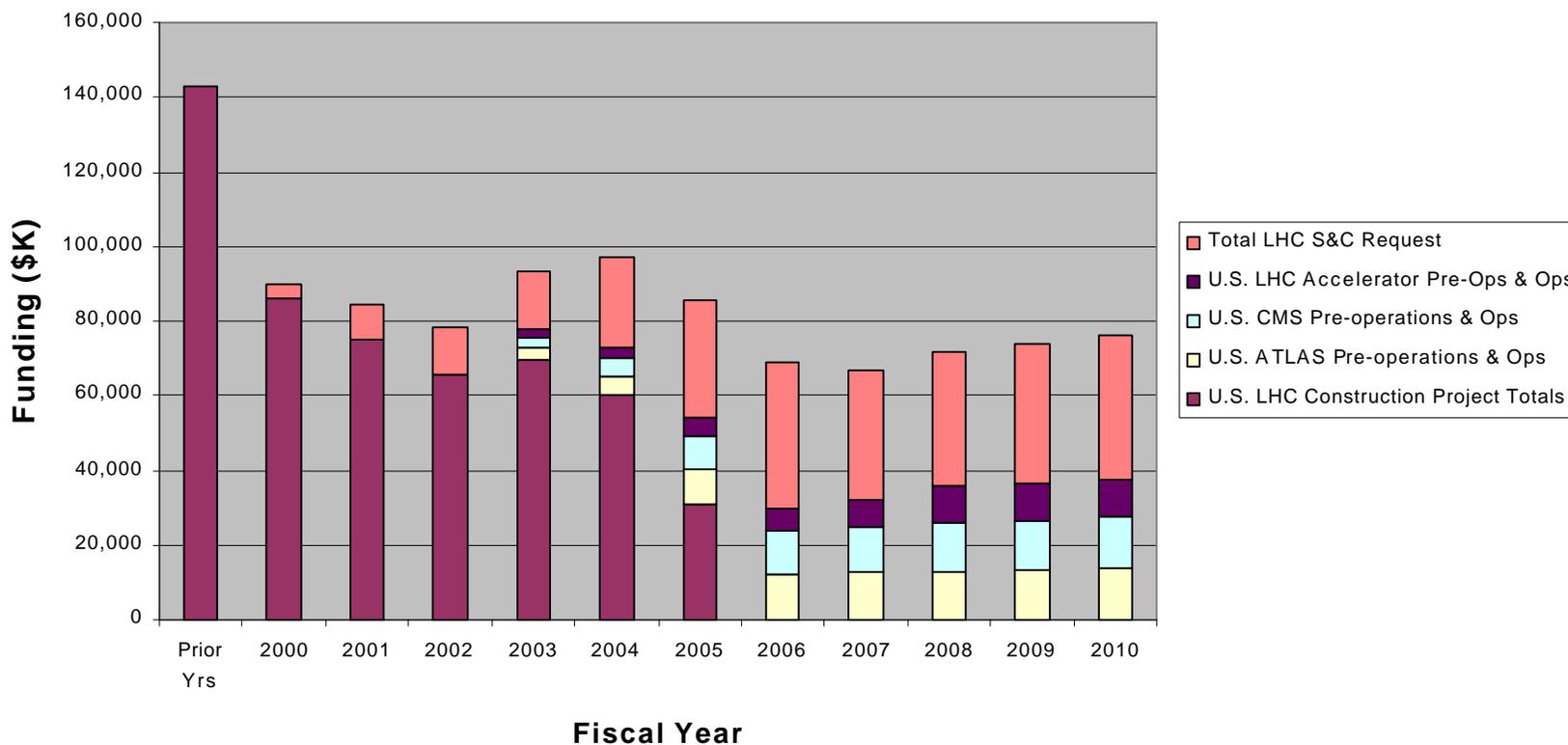




# U.S. LHC Funding Profiles



U.S. LHC Funding Profiles





## *U.S. LHC M&O Needs FY03*



### **U.S. LHC Accelerator**

- >R&D on Nb3Sn 2<sup>nd</sup> gen quads for higher luminosity
- >Commissioning of U.S.-provided hardware for sector test
- >Collaboration with CERN on LHC operations/accelerator physics
- >Begin technical characterization of U.S. remote control room

### **U.S. ATLAS**

- >Commission and operate U.S.-developed LAr cryostat
- >Commission and operate U.S. supplied subsystems

### **U.S. CMS**

- >Commission HCAL Barrel calorimeter with cosmic rays
- >Operations, system management and data storage for U.S.-supplied subsystems.



# *Infrastructure for U.S. LHC Research Program*



## **Computing Grid**

**GriPhyn, PPDG & EuroGrid Projects**

## **U.S. External and Internal Network Bandwidth**

**CERN “wetlink”**

**French (BaBar) and Italian (CDF) links**

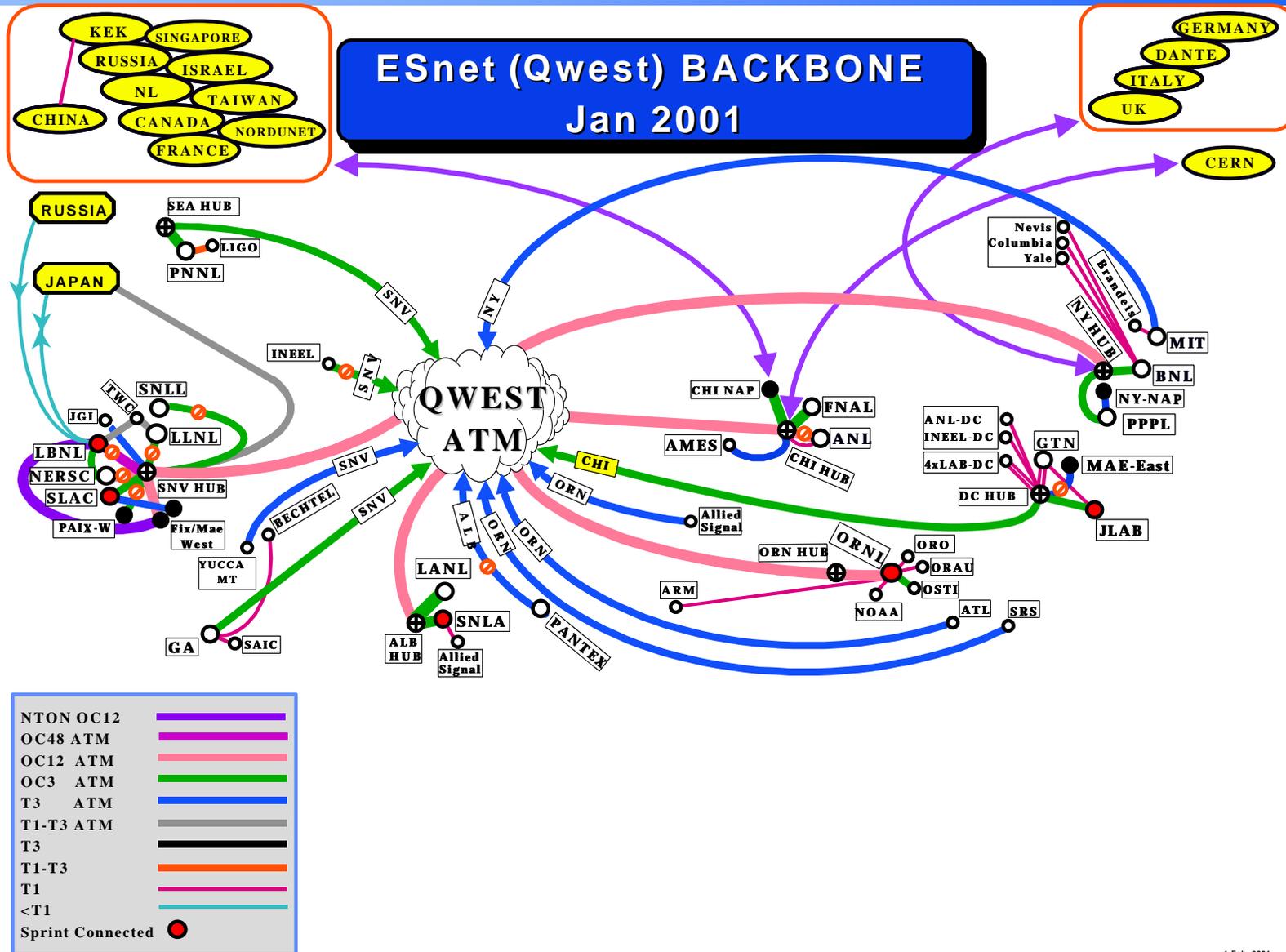
**ESNET connections**

## **Working Group on Trans-Atlantic Bandwidth**

**<http://gate.hep.anl.gov/lprice/TAN/Agenda.html>**

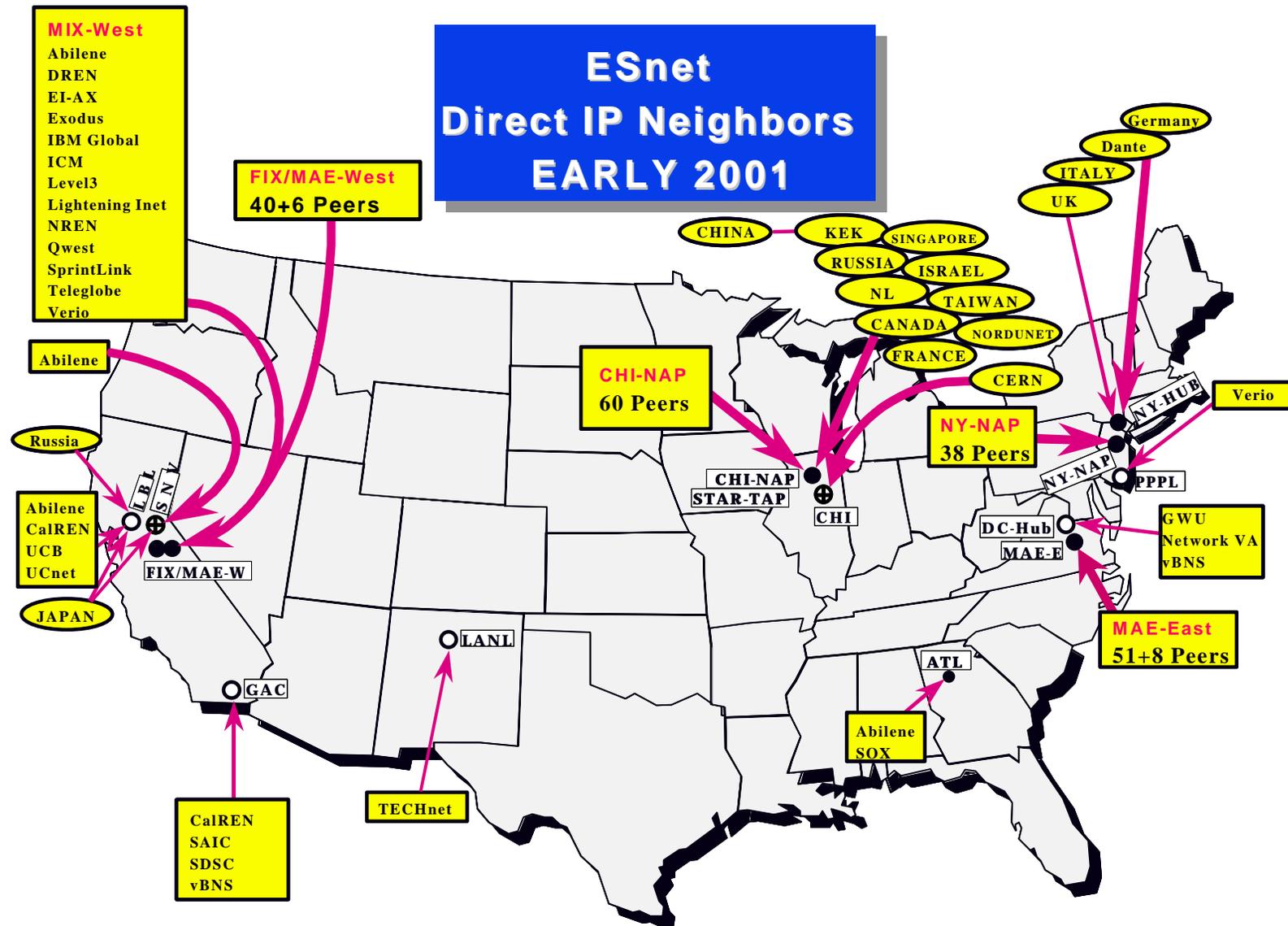


# ESnet Backbone





# ESnet Connection Points





# Network Limitations & Bottlenecks Example

