

## FERMILAB

### NuMi Off-Axis Neutrino Appearance (NOvA) Experiment Project Management

#### Lessons Learned

##### Context:

Fermilab is entering a new, transitional era defined by the transformation from operating a very large experimental facility over several decades to managing and delivering a portfolio of new projects within technical performance, budget and schedule expectations. Any one project that does not deliver on its expectations can adversely affect the ability to obtain additional projects. The NOvA project involves substantial construction activities at both the Fermilab campus and the Ash River site in Minnesota. The Project (TPC = \$278) is about 15 months from completion and from a technical standpoint, is progressing steadily. There is, however, considerable work left to do, amounting to about \$46 million (<20 percent of the total project cost). The Laboratory is funded to do this work, but the remaining contingency is very small and was drawn down unexpectedly and very quickly during the end of FY12. This raised significant concern from the DOE (HEP and the Office of Science) as well as Laboratory management.

##### Issue:

Throughout CY12, internal and external reviews identified some systemic weaknesses in execution of some construction activities and fabrication of components, including procurement planning and execution, cost estimating, and internal project communication. An independent assessment of the cost to complete and needed contingency on work to go was requested by the Fermilab Directorate, and conducted in late November – early December 2012 by a team of experienced project managers external to the project.

The NOvA contingency problem was masked by less clear reporting from the project and revealed project oversight functions that were not meeting expectations. These Project Management System concerns have the potential to impact other projects and operational activities at the Laboratory if not addressed. Coincident with the recent experiences associated with NOvA, Fermilab is actively planning or executing a large and growing number of new projects envisioned to come to fruition over the coming decade, mandating the transition of the project management system at Fermilab to provide added confidence that approved projects will be delivered.

##### Lessons Learned:

*The following lessons learned from NOvA were shared with DOE-HEP on December 14, 2012.*

##### **Project Management Lessons:**

- The project was not using the Estimate to Complete (ETC) in the way it is normally defined in project management. Standard project management practice defines the ETC for a particular element as:  $ETC = \text{Base Cost to Go} + \text{Projected Additional Cost on Work to Go}$ . This can be calculated through statistical methods to provide input to an assessment of the ETC each month. In using such a mainly a statistical method to represent the ETC, the project was generally including the second half of the sum in the documented ETC, because it missed the in-progress or planned change requests, giving an incomplete sense of the Estimate to Complete. At some level, the Project Manager's *Identified Contingency Needs* spreadsheet provided this, but it is was not part of the standard monthly reports.
- The project was managing contingency as a percent on a task by task basis, and not according to the risks that remain on the project. The uncertainties on the work remaining was not transparent with this method. The Project Manager served to judge how many of these independent assessments were likely to occur together, but without a systematic documentation of this assessment, it was not clear to other managers and stakeholders. This method also allowed the L2 Managers to continue to believe that the percent contingencies on each activity were available to them, which is not how the project was being managed, and which could lead to their believing the available budget is higher than it actually is.

## **FERMILAB**

### **NuMi Off-Axis Neutrino Appearance (NOvA) Experiment Project Management**

#### **Lessons Learned**

The Project Manager managed all the contingency and adjusted priorities to accommodate risks as they occur. Since contingency for cost risk was not associated with specific risks on the project, it was difficult for Fermilab management and DOE to gauge what the level of risk was and to understand the how contingency was being managed.

- By not having a complete ETC, and not updating the base costs well in advance, plus not managing contingency to the risks that remain, the assessment of contingency remaining on the costs to go was unclear. Carrying contingency for items with a 100% certainty of being needed on the project, instead of incorporating that contingency estimate into the base, gave a false sense of the contingency available.
- The change control process is, to a large degree, was a monthly exercise in: 1) getting that month's work that should have started but didn't pushed out so that variance thresholds were not triggered; and 2) incorporating contingency use into the project base almost as it was used. This was so time-consuming, that there was little time for the estimate-to-complete process and forward planning to occur.
- There was not an estimate of the unknown unknowns on the project, which was the responsibility of the Project Manager in conjunction with Fermilab management and the DOE Federal Project Director.

Fermilab has been on a trajectory focused on enhancements to the Project Management and Integrated Planning capabilities for some time - for example, the Lab Director brought an experienced project manager (Carl Strawbridge) on board in early 2012 to help refine our systems. This is very much a work in progress, and it's something the entire leadership team is focused on, and contributing to. The reflections from the NOvA experience/lessons learned did further inform (and accelerate) actions that were already in process (or being planned) for the Fermilab Project Management System. As a result, there were several general management lessons and improvement themes realized:

#### **General Management Lessons**

These actions focused on three primary areas: *people*, *systems/tools*, and *oversight*. A brief summary of key actions in these areas follows:

##### *Revitalizing project management teams*

One of management's fundamental accountabilities is to identify, evaluate, assign and guide the development of candidates from across the Laboratory for project leadership positions. In order to facilitate this, Fermilab has stood up a "Project Management Planning Board" to contribute to decision making associated with leadership team appointments to each of our projects and then support those teams. The board is chaired by the Deputy Director and includes the Associate Laboratory Directors, 5 Division/Section Heads and staff support. The PMPB was established in November 2012 to provide a management board that meets regularly to identify, evaluate, develop, guide and recommend candidates from across the Laboratory for project leadership positions, capture and address lessons learned, and follow-up project leadership issues raised within Performance Oversight Group (POG) or Project Management Group (PMG) meetings. The PMPB is also charged with defining the institutional expectations for training and qualification of project management staff.

## FERMILAB

### NuMi Off-Axis Neutrino Appearance (NO $\nu$ A) Experiment Project Management

#### Lessons Learned

##### *Systems and tools*

Fermilab has been modernizing and standardizing our systems and tools -- we've upgraded and expanded the availability of critical tools such as Primavera P6 and Cobra to project staff. This has included providing focused training on these tools for the project staff. Attention has also been turned to providing improved service support for the projects. The Office of Integrated Planning was restructured to become the *Office of Integrated Planning and Performance Management*. Primary roles for this organization are to : (a) Leading multi-year, forward-looking planning and integration of institutional plans, programs, projects, operations and budgets; and (b) developing and maintaining integrated laboratory systems and management processes for strategic planning and goal setting, project and program oversight, enterprise risk management and performance planning and oversight. On a similar vein, we've refocused the office of *Project Support Services* (formerly Office of Project Management Oversight) on enabling services, and elevated the 'oversight' accountability to the Leadership Team. These changes were made effective December 1, 2012 (Attachment 1); the primary accountabilities for the office of Project Support Services transitioned to:

- Providing project controls skills/staff as needed
- Supporting/Facilitating PM training and certification
- Optimizing core project management processes (scheduling, cost estimating, risk management, etc.)
- Assisting IPT leaders with project initiation phase activities
- Maintaining templates/standardized system/approaches for PM plans

In order to meet these accountabilities, additional project control staffing resources are in the process of being added to the office.

##### *Enhanced leadership engagement and oversight*

Fermilab has re-framed the manner in which we are reviewing projects. In this regard, accountabilities have been clarified and re-affirmed at all levels of the organization, from the Board of Directors through the Director to line management. Our oversight of projects is also transforming, and takes place at several levels.

- The "Project Management Groups" have been enhanced to provide an important forum for the Project Manager to coordinate project planning and problem solving with project team members and collaborators, laboratory and other interfacing organizations. The PMG is critical as the first-level oversight mechanism that supports the Director, ALDs and Division Heads in fulfilling laboratory project oversight responsibilities and provides a venue for Project Managers to raise significant issues to lab management for assistance, if required. The PMG meets regularly to manage issues, assess progress, evaluate performance metrics and trends, and initiate actions as needed to maintain satisfactory progress to plans. These meetings commence once a project has attained CD-0 and provide a structured forum for Project Manager to coordinate project planning and manage issues. They are co-chaired by the Project Manager and responsible line manager (with oversight accountability). The PMGs provide a structured forum for the review of:
  - Overall Project Assessment
  - Cost/Budget performance
  - Schedule performance
  - ETC/EAC
  - Risk management
  - Procurement Issues
  - Labor/staffing issues
  - Change requests
- In addition, we've established a forum and protocol for direct engagement between the Leadership Team

**FERMILAB**

**NuMi Off-Axis Neutrino Appearance (NO $\nu$ A) Experiment Project Management**

**Lessons Learned**

and the entire community of our 413.3 Project Managers. The 'Performance Oversight Group' was established in December 2012 and is chaired by the Laboratory Director. The group includes the Deputy Director, Associate Laboratory Directors, the Division Heads from the Accelerator, Particle Physics and Computing Sectors and the Sections Heads from Facilities Engineering Services and ESH&Q. The POG meets on a regularly scheduled basis – the 4<sup>th</sup> week of each month (which allows for performance data to be processed through the previous month. This is a new and important environment that has been created for the community of Project Management leadership and senior Laboratory leadership to engage directly to discuss project performance. Each project provides a summary of:

- Project at a glance
- Schedule status
- Budget/cost/funding
- Risk summary
- ES&H issues
- Project Manager Issues

The POG has also created a productive setting for project managers to learn from one-another while they are engaging line management and senior Lab leadership in a dialogue about project performance, issues, trends, challenges and lessons learned. POG meetings will also serve as an opportunity to share common experiences between Project and Laboratory managers.

These general management lessons learned improvement themes were included in the Fermilab budget briefing to DOE OHEP on February 28, 2013 (Attachment 2, excerpt).

From: [owner-allhands@listserv.fnal.gov](mailto:owner-allhands@listserv.fnal.gov) on behalf of [Fermilab Today](#)  
To: [allhands](#); [fermilabtoday](#)  
Subject: Fermilab Today - Tuesday, Dec. 4  
Date: Tuesday, December 04, 2012 9:13:20 AM

For non-HTML users, Fermilab Today is available online at <http://www.fnal.gov/pub/today/>

 <span style="float: right;">Tuesday, Dec. 4, 2012</span>		
Subscribe   Contact Us   Archive   Classifieds   Guidelines   Help <span style="float: right;">Search</span>		
Calendar	Feature	Director's Corner
<p><a href="#">Have a safe day!</a> Tuesday, Dec. 4</p> <p><b>3 p.m.</b> <a href="#">LHC Physics Center Topic of the Week Seminar</a> - WH11 Speaker: Alexander Paramonov, Argonne National Laboratory Title: Study of Jets Produced in Association with a Vector Boson</p> <p><b>3:30 p.m.</b> DIRECTOR'S COFFEE BREAK - 2nd Flr X-Over</p> <p>THERE WILL BE NO ACCELERATOR PHYSICS AND TECHNOLOGY SEMINAR TODAY</p> <p><b>Wednesday, Dec. 5</b></p> <p><b>3:30 p.m.</b> DIRECTOR'S COFFEE BREAK - 2nd Flr X-Over</p> <p><b>4 p.m.</b> <a href="#">Fermilab Colloquium</a> - One West Speaker: David Keith, Harvard University Title: The Risks and Efficacy of Solar Geoeengineering</p> <p>Click here for <a href="#">NALCAL</a>, a weekly calendar with links to additional information.</p>	<p><b>Handler encourages young scientists to make research accessible to government</b></p>  <p>Physics professor Thomas Handler delivered a Fermilab Colloquium talk on Wednesday on science and public policy. Photo: Jessica Orwig</p> <p>Scientists have a responsibility not only to advance their research, but also to make it accessible to those who shape public policy, says Thomas Handler, who spoke at last week's Fermilab Colloquium. It requires an understanding of the language of government as much as that of science, he said, and more often than not, scientists aren't versed enough in policy-speak to communicate well with lawmakers.</p> <p>"We have to be clear that we're all using the same dictionary," he said. "Our use of words is different from the way the public uses them."</p> <p>Handler, a Fermilab user and professor of physics at the University of Tennessee, has made it part of his mission to teach future scientists and science policymakers to be fluent in both languages. Two years ago he started a <a href="#">class</a> at the university for undergraduates and graduates on the interface between science and public policy.</p>	<p><b>Organizational changes</b></p> <p>Several organizational changes went into effect this week at Fermilab and are now reflected in the <a href="#">organization chart</a> for the laboratory. The changes are important but do not alter the fundamental structure of the laboratory. They are primarily in the supporting areas for laboratory planning, technology transfer, project management and international collaboration. The changes will help Fermilab to be more efficient and effective and will help to address the growing importance of international partnerships and the new programs at the Illinois Accelerator Research Center (IARC) with their associated need for managing technology transfer. They also help us with functions that we have been performing during the last few years in less than optimal ways.</p>  <p>Fermilab Director Pier Oddone</p> <p>Following is a brief overview of the reorganization; more detailed explanations of each change will be conveyed through <i>Fermilab Today</i> articles over the next couple of months.</p> <p>The Office of Integrated Planning (previously under the Office of Program and Project Support) will become the <b>Office of Integrated Planning &amp; Performance Management</b> and will remain in the Directorate. A search is currently under way for an office head, who will lead the planning efforts at the laboratory, connecting more effectively the technical areas and the financial</p>

## [Ongoing and upcoming conferences at Fermilab](#)

### Campaigns

#### [Take Five](#)

### Weather



**Mostly sunny**  
55°/28°

[Extended forecast](#)  
[Weather at Fermilab](#)

### Current Security Status

[Secou Level 3](#)

### Current Flag Status

[Flags at full-staff](#)

### Wilson Hall Cafe

#### Tuesday, Dec. 4

- Breakfast: All-American breakfast
- Minnesota chicken and rice
- Chicken quesadilla
- Baja chicken enchilada casserole
- Smart cuisine: pork piccata
- California turkey panini
- Assorted pizza by the slice
- Taco salad

[Wilson Hall Cafe Menu](#)

### Chez Leon

#### Wednesday, Dec. 5 Lunch

- Cajun jambalaya (shrimp, chicken and andouille sausage)
- Mixed-green salad
- Sour-cream lemon pie

#### Friday, Dec. 7 Dinner

- Mushroom soup with chorizo and scallions
- Pecan-crust beef tenderloin
- Cauliflower gratin
- Brussels sprouts with lemon and bacon

"They learn that there's more than just science that goes into science legislation," he said. He teaches students about all the variables of science legislation, which are usually far more numerous than they think.

Handler, who currently works on the NOvA experiment, had spent most of his career studying meson and neutrino physics when, about eight years ago, he began making trips to Washington, D.C., as a member of the Fermilab Users' Executive Committee. His interests gradually shifted from science in the laboratory to science as understood on Capitol Hill.

"I started to recognize that what you see and hear in the media doesn't fully portray what goes on in Congress," he said. The portrayal of contentiousness is exaggerated, he said, and legislators can be very receptive to scientists' recommendations, especially when offered as respectful, researched advice. Too frequently, he said, these recommendations come across as decrees sent down from the halls of ivy to the halls of government.

It's a message he wants to bring to students early in their own careers, and at least one of his former students has made the switch from science scholarship to the public sector. This spring he will teach the public policy class for the third time.

By imparting what he's learned as a seasoned advocate of science to government, he hopes to influence the next generation of scientists to become excellent science advocates themselves—not just good researchers.

"It's been an interesting journey," he said. "If I'd known 30 years ago what I know now, I'd have made a change to working in public policy a long time ago."

—*Leah Hesla*

### Photo of the Day

## Arrangement in gray

areas of the laboratory.

To assist with our growing number of international partnerships, we have created an **Office of International Programs**. It will be led by Shekhar Mishra and reside in the Directorate. Laboratory scientists with connections in various regions of the world will contribute their expertise as we expand our international collaboration in the many projects in front of us.

IARC opens a new important aspect of the laboratory, working closely with industrial partners toward societal benefits and training a new generation in accelerator technology. Thus **IARC is now listed as a major initiative for the laboratory** along with LBNE and Project X. IARC will continue to be led by Bob Kephart.

An **Office of Partnerships and Technology Transfer** has been established to support the increased emphasis on the application of accelerators brought by IARC. This office will assist with the many issues that arise in managing intellectual property and partnerships with industry. This office resides in the Operations Sector, reporting directly to Jack Anderson. While its emphasis initially will be on the IARC programs, it will also provide support to other areas of the laboratory. We will recruit an expert in this area to head the office.

The Office of Project Management Oversight will become **Project Support Services**, which will be headed by Dean Hoffer, and will be relocated to the Operations Sector. It will continue to assist and train project personnel, help organize reviews and set standards for the management and control of projects. The function of project oversight will be carried out by the **Project Oversight Group**, constituted by the senior managers of the laboratory and meeting regularly to oversee all projects.

The **Office of Quality and Best Practices** will be moved under Nancy Grossman's area, ES&H, which will be renamed ESH&Q. The quality programs are more general than just ES&H but use much of the same methodology. They are closely linked to our emphasis on Human Performance Improvement now being implemented across the laboratory.

- Chocolate mousse pie

[Chez Leon Menu](#)

Call x3524 to make your reservation.

## Archives

[Fermilab Today](#)

[Director's Corner](#)

[Result of the Week](#)

[CMS Result](#)

[Physics in a Nutshell](#)

[Tip of the Week](#)

[User University Profiles](#)

[Related content](#)

## Info

*Fermilab Today*

is online at:

[www.fnal.gov/today/](http://www.fnal.gov/today/)

Send comments and suggestions to:

[today@fnal.gov](mailto:today@fnal.gov)

Visit the Fermilab

[home page](#)

[Unsubscribe](#) from

*Fermilab Today*



Fog blanketed Fermilab yesterday morning. Photo: Timothy Niemiec, BSS

## From WDRS

### Learn how to reduce clearance through customs from hours to minutes

If you travel overseas, then plan to attend a presentation by Fermilab International Services (in collaboration with the Users' Executive Committee) on Global Entry, a program that allows for expedited clearance through immigration and customs on return to the United States. Attendees will learn details about the program, the application procedure and other U.S. government programs that facilitate travel.

Enrollment in the Global Entry program can significantly reduce the customs process from hours to minutes. All U.S. citizens, lawful permanent residents and certain nationals of Canada, Mexico, the Netherlands and South Korea are eligible to complete the application process, which consists of two steps: an online application and an interview with the Bureau of Customs and Border Protection.

The application process requires an interview that is usually conducted at O'Hare International Airport after preliminary security clearances have been completed. However, International Services has arranged for CBP security clearance officers to visit Fermilab on Feb. 28, 2013, to conduct all interviews with qualifying Fermilab employees and

In upcoming issues of *Fermilab Today* you will learn more details about how these various changes will help us be more effective and streamline some of our operations. We are implementing these changes largely by redeploying existing resources, though there will be a few additional personnel required as the IARC and Technology Transfer functions grow in the laboratory.

## Construction Update

### PXIE cave construction begins



Construction for the Project X Injector Experiment has recently begun. Photo: Jerry Leibfritz, AD

Construction of the concrete shield cave for the Project X Injector Experiment recently began in the Cryomodule Test Facility building. PXIE is an R&D test accelerator that will replicate the front-end portion of Project X. It will be located at the CMTF building, inside a 150-foot-long concrete shielding cave. The first shield blocks arrived in November and were set in place to form the entry labyrinth of the test cave. Delivery of the blocks will continue over the next couple of months, with the goal of having the first half of the cave built by February 2013 to coincide with the installation of the PXIE ion source.

## Announcements

### Today's New Announcements

[Clearance through customs - from hours to minutes - Dec. 13](#)

[Revised Procedures for Researchers document online](#)

[NALWO Holiday Tea - today](#)

users who have registered with International Services for an interview.

#### In the News

### **New chairman for House Science, Space, and Technology Committee**

**From *FYI: The AIP Bulletin of Science Policy News*, Nov. 30, 2012**

When the new Congress convenes in January, Representative Lamar Smith (R-TX) will chair the House Science, Space, and Technology Committee. Smith will replace Ralph Hall (R-TX) who has chaired the committee since January 2011.

[Read more](#)

#### In the News

### **Higgs matters**

**From *The New York Times*, Nov. 30, 2012**

Clear explanations of the Higgs boson, also dubbed the "God Particle," have been about as elusive as the particle itself, which was finally glimpsed in July. Despite major media coverage of the discovery, many people still don't understand its momentous meaning and significance.

Does it matter? Yes.

[Read more](#)

[Wilson Hall super science stocking stuffer sale - today and tomorrow](#)

[C2ST screening of "A Beautiful Mind" - Dec. 6](#)

[Playgroup Holiday Party - Dec. 7](#)

[The Good Lovelies: Under the Mistletoe - Dec. 8](#)

[Fermilab Heartland Blood Drive - Dec. 10-11](#)

[AFS passwords to be discontinued - Dec. 11](#)

[Fermilab's Holiday Celebration - Dec. 13](#)

[Holiday stress relief massages - Dec. 20](#)

[An Honest Approach to Weight Management - register by Dec. 21](#)

[Professional development courses](#)

[International Folk Dancing every Thursday through December](#)

[Indoor soccer](#)

[Employee discount at Journey Cycle and BMX](#)

[Additional Fermilab employee discounts](#)

[Atrium work updates](#)

---

[Submit an announcement](#)

Attachment 2

Excerpt from larger presentation

# Lab Overview

Young-Kee Kim

DOE OHEP Budget Briefing

February 28, 2013



# Today's Agenda

Time	Topic		Speaker	
8:30	Lab overview		60' + 30'	Young-Kee Kim
10:00	Break			
10:30	Budget summary		30' + 10'	Young-Kee Kim
10:40	Special topics	Accelerator operations Detector and Computing operations IARC <b>Project Management</b> NOvA: completion to early operations Computing: streamline practices	40' + 10'	Stuart Henderson Young-Kee Kim Bob Kephart Jack Anderson Greg Bock Vicky White
Noon	Lunch			
1:00	Breakout sessions on research and technology development (see next slide)			
4:00 or 4:30	Wrap-up			
5:00	Adjourn			

# Project Management Initiative:

## Enabling people and systems for success

### **Revitalize**

People &  
Performance

- **People:** developing leaders & teams with appropriate experience, training and certification.
- **Performance:** emphasis on risk management, metrics and productive inquiry.

### **Re-tool**

Systems,  
Services &  
Information

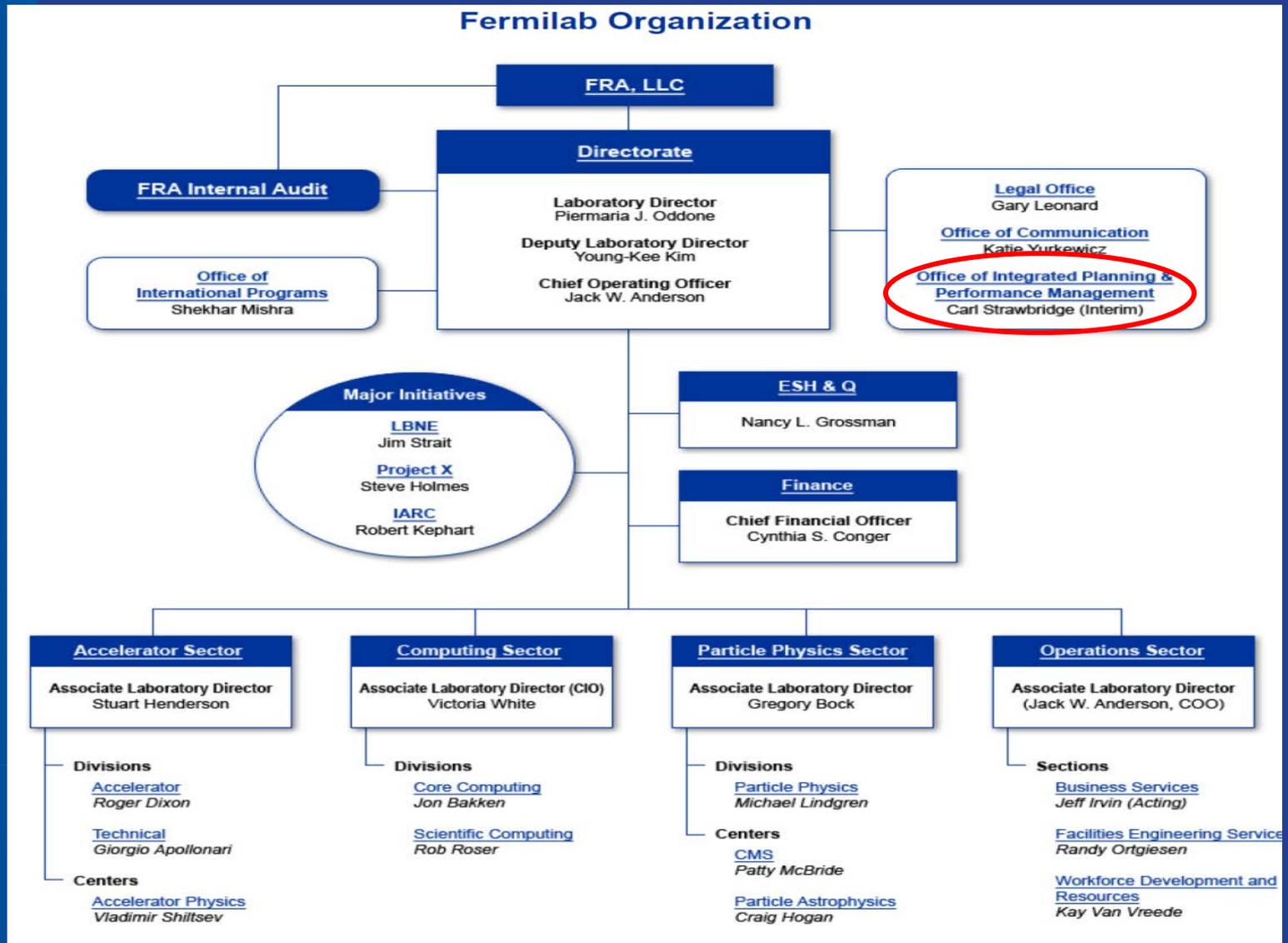
- **Systems:** modernize and standardize systems & tools
- **Services:** refocused Integrated Planning and Project Support Services Offices, resourcing (e.g., project controls, procurement staffing).
- **Information:** standardized, trendable information for accountable staff.

### **Review**

Accountability &  
Oversight with  
Transparency

- **Accountability:** expectations expressed at all levels
- **Oversight:** engage at multiple levels (PMG's, POG) including monthly reviews w/direct interaction between project and Lab leadership.
- **Transparency:** inclusive and open to independent review.

# Recent Structural Changes



# Recent Structural Changes

