-----Original Message-----
From: isaacson@lanl.gov [mailto:isaacson@lanl.gov]
Sent: Thursday, August 18, 2005 6:03 PM
To: KIRK.W.OWENS@saic.com
Subject: Fwd: Re: Fwd: Metropolis Center

Kirk, in the body of the email from Nick Nagey below, the answers to your questions are provided.

X-Sieve: CMU Sieve 2.2
X-Sender: sradz@harold-mail.lanl.gov
Date: Tue, 16 Aug 2005 15:40:32 -0600
To: isaacson@lanl.gov
From: "Susan D. Radzinski" <sradz@lanl.gov>
Subject: Fwd: Re: Fwd: Metropolis Center
X-PMX-Version: 4.7.1.128075

John, I'm sending this to you again. The answers to the questions are in the text of the e-mail. You may have sent only the attachment to Kirk.

Susan

John,

Answers from Nick to Kirk's questions.

Susan

X-Sieve: CMU Sieve 2.2
To: "Susan D. Radzinski" <sradz@lanl.gov>
Cc: vir@lanl.gov, phil_s@lanl.gov, mbv@lanl.gov
Subject: Re: Fwd: Metropolis Center
Sensitivity:
X-Mailer: Lotus Notes Release 6.5.1 January 21, 2004
From: nagy@lanl.gov
Date: Mon, 8 Aug 2005 15:04:39 -0600
X-MIMETrack: Serialize by Router on DominoMail/LANL(Release 6.5.1|January 21, 2004) at
08/08/2005 03:04:40 PM
X-PMX-Version: 4.7.1.128075

Susan,

We've provided answers to the questions that you posed:

1. When did the Metropolis Center (SCC) go on line?
The "Q" computer (QA) was installed in June, 2002. It is rated at 10 tera-ops.
The other half of "Q" (QB) was installed in October, 2002. It is also 10 tera-ops.

2. When did it reach its current level of 30 tera-ops?
"Lightning" (a Linux cluster computer) was made available to users in October, 2003. It was rated at approx. 11 tera-ops. In September, 2004, it was upgraded to a 13 tera-op computer. Thus, the current computer capacity at the Metropolis Center is approximately 33 tera-ops.

3. Is there any recently updated information of the need for and purpose served by this supercomputing capability?
Please see the ASC website: `http://www.lanl.gov/projects/asci/`
The "ASC NNSA" link explains all of the various requirements of the ASC program.

4. Future plans?
In September, 2005, we expect to install another Linux cluster ("Bolt"). It will be rated at 21 tera-ops.

Depending on next year's budget, we could be acquiring various "tri-lab capacity computers" that could be rated at 60 tera-ops.
Again, depending on the budget, the Laboratory could also acquire the next "capability" computer within the DOE complex. This machine could be rated as high as 150 tera-ops. This could possibly happen in FY2006. These are certainly optimistic scenarios, but both the "tri-lab" and the "capability" computers are mentioned in various versions of next year's budget.

Our present electrical capacity for computing in the Metropolis Center is 7.2 mega-watts. The previously mentioned computers will probably consume most of this. As we have discussed before, new computers are becoming increasingly efficient. Depending on the budget, we could be adding over 200 tera-ops of computing capacity/capability next year. This should require less than 4 mega-watts of power. Recall that "Q" (20 tera-ops) requires approximately 2 mega-watts!

We are currently planning an upgrade of 4.8 mega-watts in the 2006-2007 timeframe. This will bring our total electrical capacity for computing to 12 mega-watts (still well below our original EIS prediction of 30 mega-watts). I would be surprised if we require more than 12 mega-watts in the foreseeable future. As new computers arrive, older (less efficient) computers will be retired. Our number of tera-ops should increase significantly; our number of mega-watts should stabilize at less than twelve.

I hope this helps! Please let me know if there's anything else that you need.

Nick

"Susan D. Radzinski" <sradz@lanl.gov>

08/02/2005 07:19 AM

To: nagy@lanl.gov

cc

Subject: Fwd: Metropolis Center

Good morning, Nick,

Well, it seems that Elizabeth still wants this analysis in the new SWEIS that is underway. I have attached a draft of the project-specific analysis and, of course, the inevitable few more questions highlighted in blue. Will you please review the attached (because this is what will appear in the SWEIS), make comments as appropriate, and provide me answers to these questions? Many thx for your help and cooperation.

Susan

X-Sieve: CMU Sieve 2.2
X-Sender: isaacson@esh-mail.lanl.gov
Date: Mon, 1 Aug 2005 15:12:51 -0600
To: sradz@lanl.gov
From: John Isaacson <isaacson@lanl.gov>
Subject: Fwd: Metropolis Center
X-PMX-Version: 4.7.1.128075

X-Sieve: CMU Sieve 2.2
From: "Owens, Kirk W." <KIRK.W.OWENS@saic.com>
To: "'isaacson@lanl.gov'" <isaacson@lanl.gov>
Cc: "Hoffman, Robert" <ROBERT.HOFFMAN@saic.com>
Subject: Metropolis Center
Date: Mon, 1 Aug 2005 16:46:44 -0400
X-Proofpoint-Spam: 0
X-Perlmx-Spam: Gauge=XXXIIII, Probability=34%,
Report="BIG_FONT, EXCHANGE_SERVER, HTML_70_90,
HTML_FONT_COLOR_GRAY, HTML_FONT_FACE_ODD,
MIME_NULL_BLOCK, SPAM_PHRASE_08_13, __HAS_X_MAILER"
X-PMX-Version: 4.7.1.128075
John,

We are trying to upgrade the project-specific analysis for the Metropolis Center based on review comments. If possible, please provide the following information:

When did the Metropolis Center (SCC) originally go on line?

When did it reach its current level of 30 teraOps?

Is there any recently updated information on the need for and purpose served by this super computing capability?

Are any details available with respect to when and by what increments the computing capacity would be increased in the future, in particular between now and 2011?

I have attached a draft of the draft project-specific analysis for your reference in responding to the above questions.

Regards,

Kirk Owens
SAIC
(301) 601-5611 (voice)
(301) 353-8300 (fax)

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John Isaacson
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ENV Division M887
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Susan D. Radzinski
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Appendix J

Impacts Assessment for Expansion of Computing Capacity at the N.C. Metropolis Center for Modeling and Simulation in TA-3

This appendix provides an impacts assessment for the expansion and operation of the Nicholas C. Metropolis Center for Modeling and Simulation (Metropolis Center) in TA-3 at Los Alamos National Laboratory (LANL). Section J.1 provides background information on the expansion project and a description of the Metropolis Center. This section also addresses the purpose and need for this project, and what DOE hopes to accomplish by expanding operations in this facility. Section J.2 provides a brief description of the proposed action of providing and operating at an expanded capacity in the Metropolis Center, and the No Action Alternative of operating the Center using its existing computing platform. Section J.3 provides a brief description of the affected environment at TA-3. Section J.4 presents an impact assessment of the no action alternative and the proposed action.

J.1. Introduction

The Metropolis Center (formerly called the Strategic Computing Complex or SCC) is a 303,000-square-foot structure built at LANL to house "Q", one of the world's largest and most advanced computers. The Metropolis Center is an integrated part of the National Nuclear Security Administration's tri-lab (LANL, Lawrence Livermore National Laboratory, and Sandia National Laboratories) mission to maintain, monitor, and assure the performance of the nation's nuclear weapons through the Advanced Simulation and Computing (ASC) program. LANL's ASC program supercomputers, such as the "Q "machine, run three-dimensional codes that simulate the physics of a nuclear detonation. These supercomputers allow researchers to integrate past weapons test data, materials studies, and current experiments in simulations of unprecedented size (LANL 2004a).

Background

In 1998, the *Environmental Assessment for the Proposed Strategic Computing Complex* (SCC EA) (DOE/EA-1250) was completed for the construction and operation of the facility now referred to as the Metropolis Center. The SCC EA considered the potential impacts associated with constructing and operating this facility with a computing capacity of 30 to 50 TeraOps (30 to 50 trillion floating point operations per second) (DOE 1998a). Based on that analysis, DOE announced in its Finding of No Significant Impact (FONSI) that constructing and operating the proposed facility would not result in significant environmental impacts as defined by NEPA (DOE 1998b).

In the SCC EA, DOE acknowledged that computing capability requirements at LANL were expected to evolve to greater than a 50-TeraOp capacity, and that the 30 TeraOp and 100 TeraOp levels were short-term and long-term goals, respectively. With the Metropolis Center presently operating at the 30 TeraOp level, DOE is now pursuing a 100 TeraOp capability consistent with its long-term goal for the Center.

Purpose and Need

DOE's Stockpile Stewardship and Management Program provides an integrated technical program for maintaining the continued safety and reliability of the nuclear weapons stockpile. As an alternative to underground testing, and due to the aging of nuclear weapons beyond original expectations, DOE must maintain a means to verify the transportation, safe storage, and reliability of nuclear weapons. Without underground nuclear weapons testing, computer simulations that can perform highly complex three-

dimensional large-scale calculations have become the only means of integrating the complex processes that occur in the life span of a nuclear weapon. At LANL, a capability of 100 TeraOps is essential for effectively running these high fidelity, full system weapon simulations. In order to best fulfill its prime stewardship mission to ensure the safety, reliability, and performance of the nation's nuclear weapons stockpile, DOE needs to enhance its existing computer system capability at the LANL Metropolis Center from 30 TeraOps to 100 TeraOps.

J.2. Alternatives Considered

No Action Alternative: Continue Metropolis Center operations using the existing computing platform

Under the No Action Alternative, the existing computing center would continue to be operated at the 30 TeraOps level as it is today. Computing capacity would not be expanded, and current infrastructure requirements would not change. As such, DOE would not attain the long-term goal of 100 TeraOps functional capability that was identified in the SCC EA (DOE 1998a).

Proposed Action: Modify and operate the Metropolis Center at an expanded computing platform

Under the Proposed Action, DOE would expand the computing capabilities of the Metropolis Center at TA-3 to support a 100-TeraOps capability. This action would consist of the addition of mechanical and electrical equipment, including chillers, cooling towers, and air-conditioning units, all of which would be added without a need to expand the external dimensions of the building(LANL 2004a).

J.3 Affected Environment

The SCC EA and FONSI identified potential environmental concerns associated with projected water and electrical requirements. Because the proposed expansion of computing capacity at the existing Metropolis Center (up to 100 TeraOps) is expected to only affect these water and electrical requirements, this analysis focuses on the affected environment and subsequent potential impacts to these infrastructure resources.

J.3.1 General Location

The Metropolis Center is located in TA-3, which is situated in the west-central portion of LANL and is separated from the Los Alamos townsite by Los Alamos Canyon. TA-3 is LANL's main technical area, houses approximately half of the Laboratory's employees, and contains about half of the total Laboratory floor space. It is the main entry point to the Laboratory, and most of the administrative and public access activities are located within its approximately 357–acre (144 hectare) boundaries. TA-3 is heavily developed and contains numerous buildings located on the top of a mesa between the upper reaches of Sandia and Mortandad Canyons. TA-3 also accommodates a mixture of the LANL activities, which include experimental sciences, special nuclear materials, administrative, public and corporate access, theoretical/computations, and physical support operations (LANL 2002).

J.3.2 Current Infrastructure

The Los Alamos water supply system consists of 14 deep wells, 246 kilometers (153 miles) of main distribution lines, pump stations, and storage tanks. The system supplies potable water to all of Los Alamos County, LANL, and Bandelier National Monument. In September 2001 DOE completed the transfer of ownership of the water production system to Los Alamos County, along with 70 percent of its

water rights (1,264 million gallons [4,785 million liters] per year). DOE has leased the remaining 30 percent of the water rights (542 million gallons [2,050 million liters] per year) to the county for 10 years, with the option to renew the lease for four additional 10-year terms (DOE 2003). In Fiscal Year 2003, LANL used approximately 378 million gallons (1,430 million liters) of water (LANL 2004c).

Groundwater in the Los Alamos area occurs as perched groundwater near the surface in shallow canyon bottom alluvium and at deeper levels in the main (regional) aquifer. All groundwater underlying LANL and the vicinity having a total dissolved solids concentration of 10,000 milligrams per liter or less is considered a potential source of water supply for domestic or other beneficial use. However, the main aquifer is the only body of groundwater in the region that is sufficiently saturated and permeable to transmit economic quantities of water to wells for public use. All drinking water for Los Alamos County, LANL, and Bandelier National Monument comes from the main aquifer. Surface water within LANL boundaries is not a source of municipal, industrial, or irrigation water, but is used by wildlife that lives within, or migrate through, the region (DOE 2003).

Electrical service to LANL is supplied through a cooperative arrangement with Los Alamos County, known as the Los Alamos Power Pool, which was established in 1985. Within LANL, DOE also operates a gas-fired steam and electrical power generating plant at TA-3 (TA-3 Co-generation Complex), and maintains various low-voltage transformers at LANL facilities and approximately 55 kilometers (34 miles) of 13.8-kilovolt distribution lines. Onsite electrical generating capability for the power pool is limited by the TA-3 Co-generation Complex, which is capable of producing up to 20 megawatts of electric power that is shared by the Power Pool under contractual arrangement. Generally, onsite electricity production is used to fill the difference between peak loads and the electric power import capability (LANL 2004c).

DOE also maintains two power distribution substations: the Eastern TA Substation and the TA-3 Substation (DOE 2003). As part of ongoing electric reliability upgrades at LANL, DOE completed construction of the new Western TA Substation in 2002. This 115/13.8-kilovolt substation has a main transformer rated at 56-megavolt-amperes (or about 45 megawatts) and provides redundant capacity for LANL and the Los Alamos townsite in the event of an outage at either of LANL's two existing substations (DOE 2003, LANL 2004c).

J.4 Impacts Assessment

J.4.1 No Action Alternative

Under the No Action Alternative, NNSA would continue operating the Metropolis Center at the current 30 TeraOps level analyzed in the SCC EA.

Table J–1 summarizes the operational requirements associated with the existing and proposed operating platforms compared with those evaluated in the SCC EA, and current available site capacity. As shown in Table J-1, the proposed water and electrical infrastructure requirements associated with operating the Metropolis Center at the 30 to 50 TeraOps level analyzed in the SCC EA would not exceed the available site or facility capacities.

Table J–1 Metropolis Center Operating Requirements

	30 TeraOp Existing Platform (No Action)	*50 TeraOp Level Analyzed in SCC EA*	*100 TeraOp Proposed Platform (Proposed Action)*	*Metropolis Center Design Capacity*	*LANL Site Usage*	*LANL Site Capacity*
Water (million liters per year)	73	239	122	239	1,430	2,050
Electricity						
Energy (Megawatt-hours per year)	44,676	62,196	78,840	262,800	492,671	963,600
Peak Load (megawatts)	5.1	7.1	9.0	30	88	110
Workers	350	300	350	NA	11,574	NA

NA=not applicable.
Sources: DOE 1998a, LANL 2004a, and Powers, P. 2005.

Electric power availability from the local pool is now estimated at 963,600 megawatt-hours (reflecting the lower thermal rating of 110 megawatts for 8,760 hours per year on the existing transmission system). In fiscal year 2003, LANL used 382,849 megawatt-hours of electricity. Other Los Alamos County users consumed an additional 109,822 megawatt-hours for a power pool total electric energy consumption of 492,671 megawatt hours. The fiscal year 2003 peak load usage was about 71 megawatts for LANL and about 17 megawatts for the rest of the county (**LANL 2004b**). The estimated peak load capacity is 110 megawatts (**DOE 2003**).

J.4.2 Proposed Action

Under the Proposed Action, DOE would expand the computing capabilities of the Metropolis Center at TA-3 to support a 100-TeraOps capability. This action would consist of the addition of mechanical and electrical equipment, including chillers, cooling towers, and air-conditioning units. The modifications would not result in any additional land disturbance, changes to the number of employees operating the Center, or increased operating hazards (**Powers 2005**). As shown in Table J-1, the proposed water and electrical infrastructure requirements associated with operating the Metropolis Center at 100 TeraOps would also not exceed the available site or facility capacities.

Although the SCC EA and FONSI indicated that operating the Metropolis Center at up 50 TeraOps would result in no significant environmental impacts, NNSA acknowledged potential environmental concerns associated with facility water and electrical requirements. To address these concerns, the SCC EA indicated that (1) cooling water for the facility would come from treated waters from the Sanitary Wastewater Systems Consolidation Plant, and (2) electric power constraints, common to all parts of Northern New Mexico, would need to be dealt with through mutual LANL/Los Alamos County power pool "shedding procedures" to balance the peak demand with load capabilities. Since that time, actual water requirements at the Metropolis Center have proven to be much less than projected. Specifically, annual water requirements of the Metropolis Center have been less than one-third of the maximum value analyzed in the EA, and projected annual water requirements of an expanded, 100-TeraOps center are still expected to be less than half of that conservative value.

In addition, significant electrical infrastructure improvements have taken place at LANL. An environmental assessment was prepared and a Finding of No Significant Impact was issued in December 2002 for a project to install two new (20 megawatt), gas-fired combustion turbine generators and to upgrade the existing steam turbines. Refurbishment of this facility, which includes upgrades to the #3 steam turbine and to the steam path and cooling tower, began in 2003. When complete in Fiscal Year 2005, these improvements should increase the output of the facility to more than 20 megawatts in the

short term. Installation of the first new combustion turbine generator at the TA-3 Co-generation Complex is scheduled to occur during the fiscal year 2004-fiscal year 2005 timeframe (LANL 2004c).

J.5 References

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DOE (U.S. Department of Energy) 1998b, *Finding of No Significant Impact for the Proposed Strategic Computing Complex, Los Alamos National Laboratory, Los Alamos, New Mexico*, U.S. Department of Energy, Los Alamos Area Office, Los Alamos, NM, December 23.

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LANL (Los Alamos National Laboratory) 2000, *Los Alamos National Laboratory Comprehensive Site Plan 2000*, Los Alamos National Laboratory Project Management Planning, LA-UR-99-6704, Los Alamos National Laboratory, Los Alamos, NM

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Powers, P., 2005, Los Alamos National Laboratory, Los Alamos, NM, personal communication (e-mail) to K. Owens, Science Applications International Corporation, Germantown, MD, *Data Request for SCC aka MCMS*, January 7.