PENNSTATE

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October 31, 2008

US Nuclear Regulatory Commission
ATTN: Mr. William Kenney
Office of Nuclear Reactor Regulation
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One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Reference: Pennsylvania State University Breazeale Nuclear Reactor
Docket No. 50-005, License No. R-2
USNRC Request for Additional Information (RAI) dated September 9, 2008

Subject: Response to RAI

Dear Mr. Kennedy:

The attachment to this letter answers the questions presented in the RAI dated September 9, 2008. If there are any questions regarding the information submitted, please contact Mr. Mark A. Trump, Associate Director for Operations at RSEC. I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 31, 2008.

Sincerely yours,

Kenan Ünlü
Director, Radiation Science and Engineering Center
Professor, Department of Mechanical and Nuclear Engineering

cc: E.J. Pell (w/o)
A.A. Atchley (w/o)
D. Sathianathan (w/o)
M.A. Trump (w/o)

Enclosures

CHAPTER 2

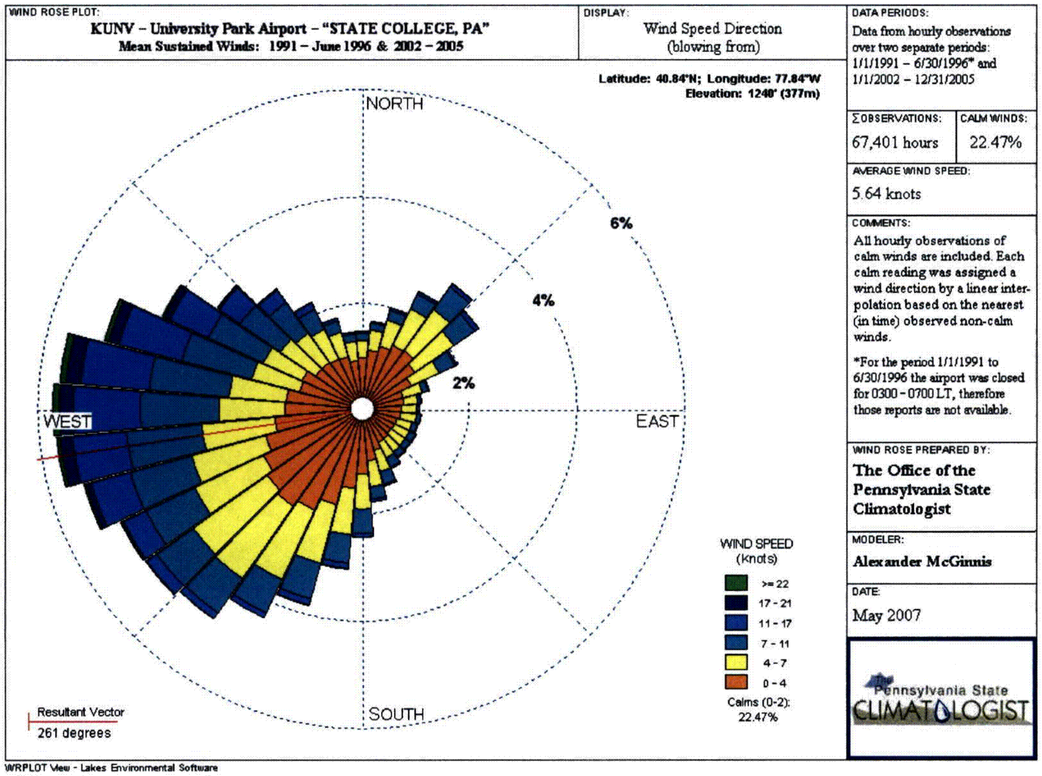
2.1 General meteorological information for the site, other than extremes, is not included in the description of site characteristics. Provide site information on temperature ranges, humidity, and average wind speed, or justify its exclusion.

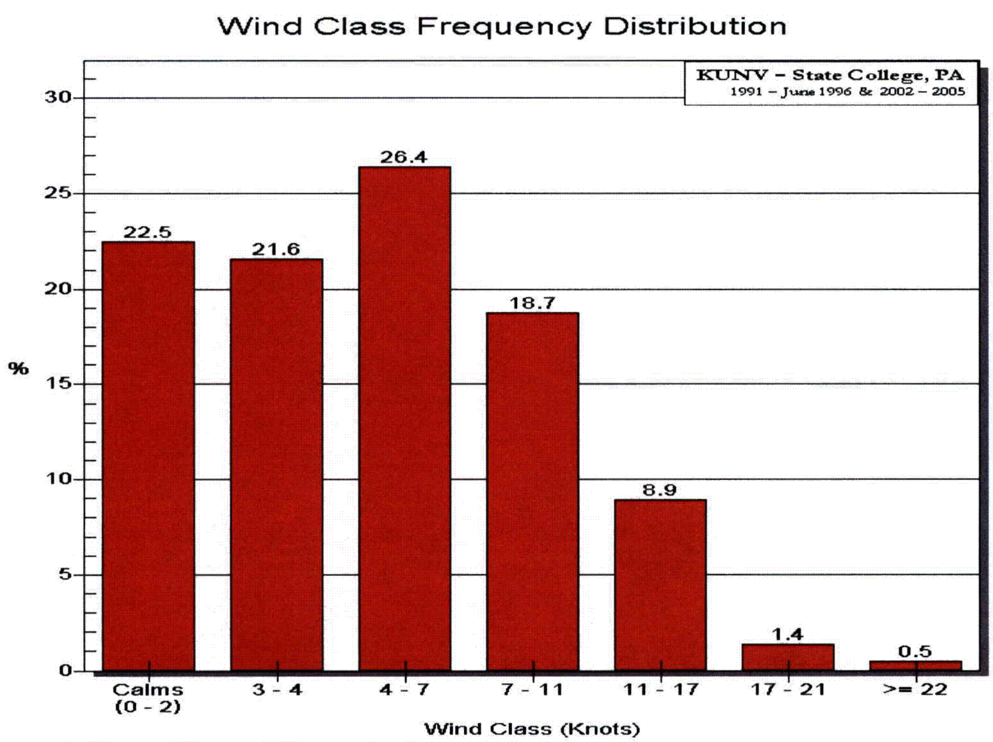
Temperatures at State College are representative of those in other valley sections of Central Pennsylvania, averaging about 4 degrees lower than those in southeastern counties and 2 degrees higher than in areas farther to the northwest. The seasonal temperature change pattern is very regular, and yearly or even monthly deviations from the norm are relatively small. In summer, the days are sometimes oppressive due to a combination of high temperatures, high relative humidity and light winds, however, temperatures generally cool to comfortable levels during the night so that heat waves of the variety occasionally experienced in the southeastern part of the Commonwealth are extremely rare. Historical temperature data is shown in the table below. (Source PSU Weather Station website)

The Climate of State College, Pennsylvania: 1882-1990 (Source PSU Weather Station website)

				Monthly Temperatures (Degrees F)			
		Averages			Extremes		
Date	High	Mean	Low	Warmest	Year	Coldest	Year
January	34.0	26.3	18.8	45.3	1950	5.4	1977
February	35.5	27.5	19.0	44.8	1925	6.1	1934
March	45.7	36.3	27.4	59.8	1945	17.5	1960
April	58.2	47.9	37.6	68.4	1941	30.6	1982
May	69.9	59.0	48.2	78.3	1911	41.9	1967
June	77.8	67.2	56.4	84.2	1934	51.7	1927
July	82.0	71.2	60.6	87.7	1955	56.8	1918
August	80.0	69.2	58.8	86.1	1938	46.9	1893
September	73.4	62.6	52.1	80.8	1930	46.3	1963
October	61.8	51.5	41.5	71.8	1963	33.8	1987
November	48.5	40.4	32.5	56.6	1975	26.4	1984
December	36.8	30.0	22.8	45.5	1923	12.0	1989

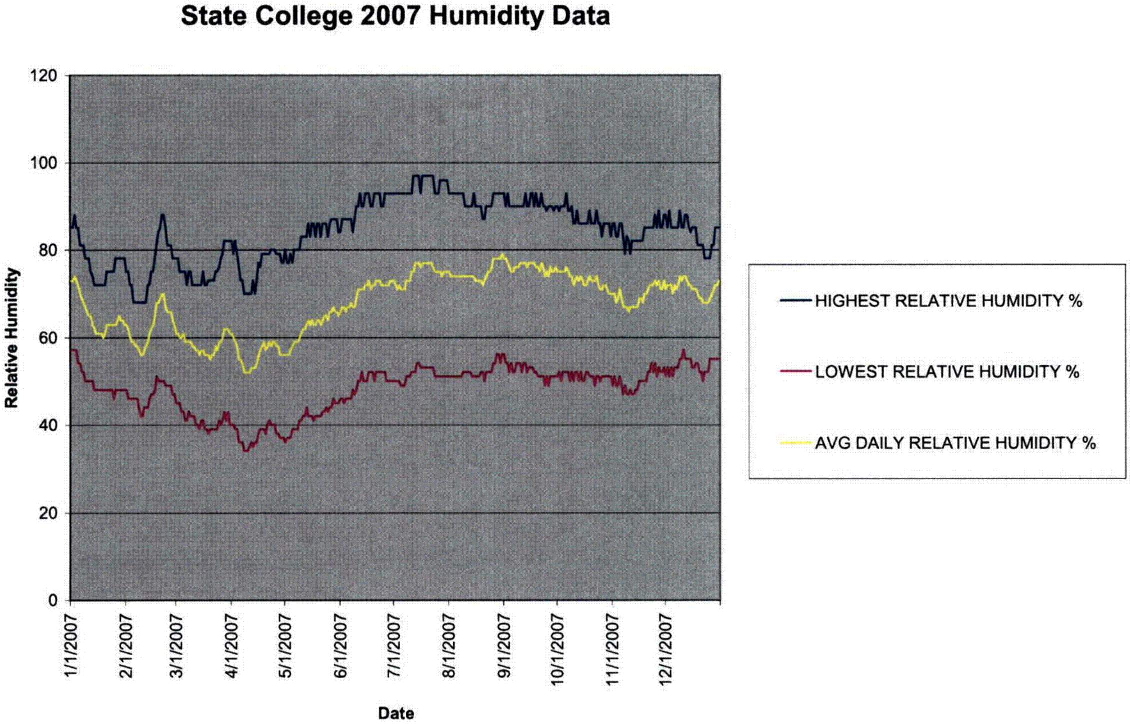
Typical wind direction and speed distributions can be interpreted from the two figures below. (Source Office of State Climatologist website)





(Source Office of State Climatologist website)

Relative humidity data for 2007 is shown graphically below and represents typical variations.



(Source WWW.Weatherdata.com)

CHAPTER 4

4.1 Section 4.2.2, Control Rods, Page IV-12. Describe how the transient rod responds to a scram signal and loss of site power.

See page IV-12 (last paragraph). A three-way solenoid valve applies air to the transient rod air piston in the rod drive cylinder to allow operation in normal (cylinder following) and pulse (rapid ejection to pre-positioned cylinder index) modes. On a scram signal or loss of safety system power the solenoid de-energizes and vents air from the cylinder resulting in gravity return of the rod to the rod bottom position. See also SAR Section 4.5.1 and Table 4-1 for scram times and reactivity insertion rates. See also the answer to question 13.12 which discusses protective system response on a loss of facility power.

4.2 Section 4.3, Reactor Pool, Page IV-18.

a. Describe the operating restrictions and controls regarding the location of the reactor during operation. Address the effects of radiation damage to the concrete pool walls and epoxy liner for the extended 20-year operational life.

Operating procedures provide controls for reactor operating positions in the reactor pool. A position evaluation process is used to qualify new positions. The process considers factors to ensure the new position does not cause reactor operational issues, ALARA concerns, unexpected reactivity coupling, or create undesired activation of wall materials. Currently 4 positions are qualified: Rabbit one, D_2O Tank, Fast Neutron Irradiation (FNI) and Fast Flux Tube (FFT).

Reactor operations do not result in significant radiation exposure of the walls or coatings of the pool as the reactor is not operated in close proximately to the wall. [redacted]

Also during the 2007 pool drain, testing of the south pool was conducted using micro-gravity and penetrating radar to examine the structure for voids. No indications of degradation or voids were reported.

To address continued protection of the concrete from water damage, the pool coating system was upgraded. A multi-stage modification was conducted on the pool walls and floor. The divider wall was injected with hydro-active grout to stop through wall leakage; the entire pool was hydro-lazed to remove loose coatings and a layer of epoxy concrete repair was applied to both sides divider wall (Belzonna® 4111 Magma-Quartz); and finally the entire pool was coated with a nuclear grade waterproof polyurea liner (InstaCote® ML-1). This liner material had been previously evaluated by a nuclear utility to 200 MRAD with no visible degradation and retained adequate elasticity. Other areas of the pool which had signs of previous repair were investigated and in some cases old repair material was removed and new concrete repair material was used (Belzonna® 4111 Magma-Quartz) before the application of the polyurea liner.

As the original epoxy paint lasted over twenty years with little evidence of degradation from age or radiation (and remains largely intact and in-place), it is anticipated the new coating will provide similar or improved protection. The concrete walls and floor of the pool show no signs of additional deterioration in areas of higher radiation exposure as compared to area of low exposure and areas with previous water damage have been upgraded. Water infiltration that can result in slow degradation of the concrete has been addressed by the new pool coating and water loss is monitored on a daily basis (during operation).

b. Provide an evaluation of the age-related degradation of the concrete and reinforcing steel and the ability of the pool to maintain structural integrity in the event of design basis seismic activity for the extended 20-year operational life. This evaluation should include a discussion of the potential damage and leakage rate from design basis seismic activity.

As noted in the discussion of the above (4.2.a), the integrity of the pool walls and floor was evaluated during the 2007 pool drain and refurbishment. The concrete walls and floor of the pool show no signs of structure deterioration from age. No cracking of the structure was in evidence and in general the epoxy coating applied in the 1970's was intact and tightly adherent over the vast majority of the pool structure. Some surface and sub-surface (under the epoxy coating) water damage was evident in areas where leakage that occurred in the 1960s and early 1970s was repaired. These areas likely had additional degradation in the 30+ years since the prior inspection and repair. The degradation was located in surface areas of the concrete and structural steel was not exposed. The old repair material in the degraded areas was removed to expose sound concrete where appropriate and repaired as described in question 4.2.a response above (Belzonna® 4111 Magma-Quartz). Future water infiltration that can result in slow deterioration has been addressed by the new pool coating and water level is monitored on a daily basis (during operation). Based on the observed condition of the structure and testing (penetrating radar and micro-gravity in south pool) there is no indication of structural deterioration that would affect the reactor pool's ability to withstand the exceedingly low seismic activity expected in this area (see SAR Section 2.5.3). We have no specific knowledge of any seismic criteria applied during the original design. Pool construction drawings, photographs, and penetrating radar show a robust design with the significant use of steel reinforcement in the original construction and recent inspection show no sign of structural deterioration.

Below are two images from the original pool drawings showing the placement of rebar in the exterior pool wall, floor, and the divider wall.

[redacted]

Details of Penn State Reactor Concrete Pool Wall Construction

4.3 Section 4.5.1, Normal Operating Conditions, Page IV-20. Provide an analysis to show worst-case reactivity effects of improperly locating the core in the pool, i.e., potential interaction between fuel storage and reactor core, or describe the controls (procedural requirements, interlocks, physical barriers, etc.) that prevent interaction between the core and any fuel in storage.

The reactor core at the PSBR has four currently allowed operating locations:

Location	**Name**	**Description**	**Reactivity Effect (Typical)**
R1	Rabbit 1	Open pool in the south end away from walls	None, reference location
FNI	Fast Neutron Irradiator	Dry 10" diameter tube with square face shielded internally from thermal neutrons and gammas with boron and lead.	-\$0.41
FFT	Fast Flux Tube	Dry 6" diameter tube with round face shielded internally from thermal neutrons and gammas with boron and lead.	-\$0.30
D_2O	Thermal Column	24" diameter tank of heavy water	+\$0.85

Qualification of a new operating location is governed by operating procedures. New locations are analyzed for reactivity coupling effects in addition to stresses and radiation effects.

Only the D_2O tank offers a positive reactivity effect of all other locations in the pool. Movement of the reactor is performed only at STANDBY or SHUTDOWN. STANDBY is a condition defined by procedure that has \$4.50 to \$5.50 of core reactivity withdrawn. Criticality typically occurs at \$7.00±0.50 depending on core design and time in core life. SHUTDOWN is defined as a condition in which the reactor is subcritical by at least \$1.00 from the reference core condition.

If the reactor were at STANDBY (\$5.50) and moved against the D_2O Tank, it would remain shutdown. Alternatively, if the reactor were at full power and accidentally moved away from the FNI (largest negative reactivity -\$0.41 for 2008 Core 53A) or against the D_2O Tank the resulting transient would be well within the analysis done in the SAR for the Reactivity Addition Accident.

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

4.4 Section 4.5.1, Normal Operating Conditions, Page IV-20. What prevents movement of fuel elements during operation?

Under all conditions (both operating and secured):

- [redacted]
- Downward motion of fuel only elements is prevented and the element is supported by the lower grid plate.
- Lateral motion of the fuel elements is constrained by (lower end of fuel) by a pin in the lower grid plate and (upper end of fuel) by the upper grid plate.
- Control rods are vertically supported by the rod drive mechanism with a below core safety plate installed to prevent the rod from falling through the core in the event of mechanism failure.
- Control rod lateral motion is constrained by both the upper and lower grid plates (note the transient rod fits inside a guide tube that penetrates through both the upper and lower grid plates)
- Procedures require the reactor be secured or in standby ($4.50 to $5.50 with scrammable reactivity available and ≥$1.00 shutdown) when moving the reactor tower.

4.5 Section 4.5.1, Normal Operating Conditions, Page IV-22, Figure 4-12. What is in position E-6 in Core Loading #52? What are the configuration restrictions regarding what may be loaded into core grid positions, i.e., must all fuel positions be filled with fuel, or can positions be vacant or filled with other reflectors or experiments? How is Technical Specification (TS) 5.2 interpreted regarding any restrictions?

Position E-6 in core loading 52 (as well as the current loading 53a) is a normally vacant core position (water hole). The position is used for loading of experiments.

TS Section 5 **Design Features** describes several features of the facility. TS 5.2 Reactor Core describes fuel/core configuration and reflector. TS 5.2 is interpreted when used in conjunction with TS 1.1.45 and 5.1 to limit the types and concentrations of fuel, fuel spacing, and reflector to be consistent with the facility design and safety analysis. This specification is not interpreted to limit core physical configurations. Positions in the core grid may be vacant or contain experiments. Experiments loaded into the core must be evaluated in accordance with SOP-5 *Experiment Evaluation and Authorization* which evaluates the experiment for safety and compliance with Technical Specifications (See also TS 3.7 *Limitations of Experiments*.

4.6 Section 4.5.3, Operating Limits, Page IV-25. Describe any burnup limits on the fuel and how it is determined when to retire fuel from use in the core.

The fuel at the PSBR has burnups ranging from [redacted] Because of the changing requirements for the reactor core, both older and newer fuel elements are typically used in any given core. Only fuel that has failed the PSBR inspection procedure (based on Technical Specifications 3.1.6 limits) is automatically retired from service.

4.7 Section 4.5.3, Operating Limits, Page IV-25. Provide an evaluation of the applicability of the General Atomics pulsing temperature limit of 830°C to the Penn State Breazeale Reactor (PSBR), and if applicable, describe the impact on the technical specifications and safety analyses. (Reference: "Pulsing Temperature Limit for TRIGA LEU Fuel," TRD 070.01006.05, Rev. A.)

Penn State has reviewed General Atomics (GA) publication TRD 070.01006.05 "Pulsing Temperature Limit for TRIGA LEU Fuel" and found no basis for additional SAR or Technical Specifications limitations based on the conclusions in the paper.

The Penn State Breazeale Reactor (PSBR) is a 1MW TRIGA Mark III reactor that is capable of pulsing to approximately 2000MW. The reactor has been pulsed over 8000 times since its installation in 1965. The current core (53A – 2008) has 103.5 fuel elements with a maximum normalized power of 1.68 at 600K average fuel temperature. The reactivity worth of the Transient Rod (pulsing rod) is $2.94 (as measured on 6/6/2008). The measured peak power and temperature for this pulse was 1357MW and 460°C with the instrumented element in the position of maximum elemental power density (MEPD). Given a maximum peak-to-measured pulse fuel temperature ratio of 1.6, the maximum temperature in the core is no more than 460°C * 1.6 = 736°C.

In the April 2008 General Atomics (GA) publication TRD 070.01006.05 "Pulsing Temperature Limit for TRIGA LEU Fuel", GA specifically reaffirms their support for the 1150°C safety limit for stainless steel clad TRIGA fuel. In addition, they recommend a lower temperature constraint for enhanced fuel reliability in pulsing TRIGA reactors of 830°C. This is not a new safety limit, but a way to limit fuel growth during pulsing and extend the useful life of the fuel. For the maximum peak-to-measured pulse fuel temperature ratio of 1.6 referenced in the same document, the result would be a measured temperature constraint of 518°C during a reactor pulse.

Fuel inspection failures (growth or bend > 0.125" IAW TS 3.1.6 or difficulty removing fuel through the top grid plate) of 12 weight percent uranium (w/o) elements have occurred at the Breazeale Reactor. While no destructive analysis was conducted, a causal analysis was performed by the staff in 1996. The analysis concluded that operating with "new" 12w/o elements in the B-ring should be avoided due to the hydrogen migration from pulsing and continued operation at high peaking factors. From 1996 onward, only used 8.5w/o elements are used in the B-ring and 12w/o elements are limited to the C-ring and outward. Elements from the set of 12w/o elements that had prior use in the B-Ring are not used in the C-Ring either. This fuel management guidance is expected to provide enhanced fuel reliability and fewer inspection failures.

In addition, current procedures require the Director's approval for pulsing greater than $2.50 and demonstration pulses are limited to $2.00. The table below shows values from Core 53A, which are typical for the Penn State Reactor.

TR Reactivity Pulsed	Peak Power	Measured Fuel Temperature	Maximum Fuel Temperature (1.6x Measured)
$1.50	105 MW	207°C	331°C
$2.00	251 MW	286°C	458°C
$2.50	638 MW	373°C	597°C
$2.75	1065 MW	407°C	651°C
$2.94	1357 MW	460°C	736°C

4.8 Section 4.6, Thermal-Hydraulic Design, Page IV-25. Provide a thermal-hydraulic analysis of the PSBR to demonstrate that natural convection provides adequate cooling to maintain clad temperatures below 500 °C, as stated in the basis for the fuel temperature safety limit of 1150 °C. Include a discussion of the analysis methods and correlations used to determine the minimum Critical Heat Flux Ratio (CHFR) for steady-state and transient operation (including the reactivity insertion accident). (Reference: "TRIGA Reactor Thermal-Hydraulic Study," TRD 070.01006.04, Rev. A.)

The Penn State Breazeale Nuclear Reactor is an open-pool TRIGA reactor with a hexagonal fuel pitch. The reactor has 80-110 fuel elements per core loading. The elements are stainless steel clad 8.5 or 12 weight percent $Zr_{1.0}H_{1.65}U$ fuel. The thermal performance of this fuel has been analyzed many times since its first use over fifty years ago. The performance of the fuel in the Penn State reactor was investigated by Haag and Levine in 1973[10]. The analysis showed nucleate boiling starting at 15% power and continuing up to full power.

The SAR (page XIII-9) states:

> *The measured fuel temperature, t_{tc}, depends on the temperature at the cladding surface mid-plane, t_c. Because of the subcooled boiling above 200kW, this temperature rises very slowly. The Δt is proportional to $(q''')^{0.33}$, where the Δt is the difference between t_c and the coolant saturation temperature.(14) As a result, it is assumed that the surface of the cladding is superheated by a fixed Δt degrees and thus at 1MW, t_c =140°C. This should be correct within ±10°C at 1MW for all NP_j's greater than 1 and less than 3.*
>
> Reference 14 in the SAR is El-Wakil "Nuclear Heat Transport" ANS 1978.

The figure below shows the behavior of pool water as the heat flux rises. (DOE-HDBK-1012/2-92 DOE Fundamentals Handbook, Thermodynamics, Heat Transfer, and Fluid Flow, Volume 2 of 3). The figure illustrates the small cladding temperature rise and change (less then 60 °C) for the large heat flux (over a factor of 10) between the onset of nucleate boiling and the departure from nucleate boiling or Critical Heat Flux (CHF).

Therefore as long as the reactor stays in a region of sub-cooled nucleate boiling, cladding temperature will be closely tied to saturation temperature (at ~2 atmospheres) in the core and the cladding will stay below 500°C as stated in the SAR. If the heat flux reaches CHF, cladding temperatures will rise rapidly.

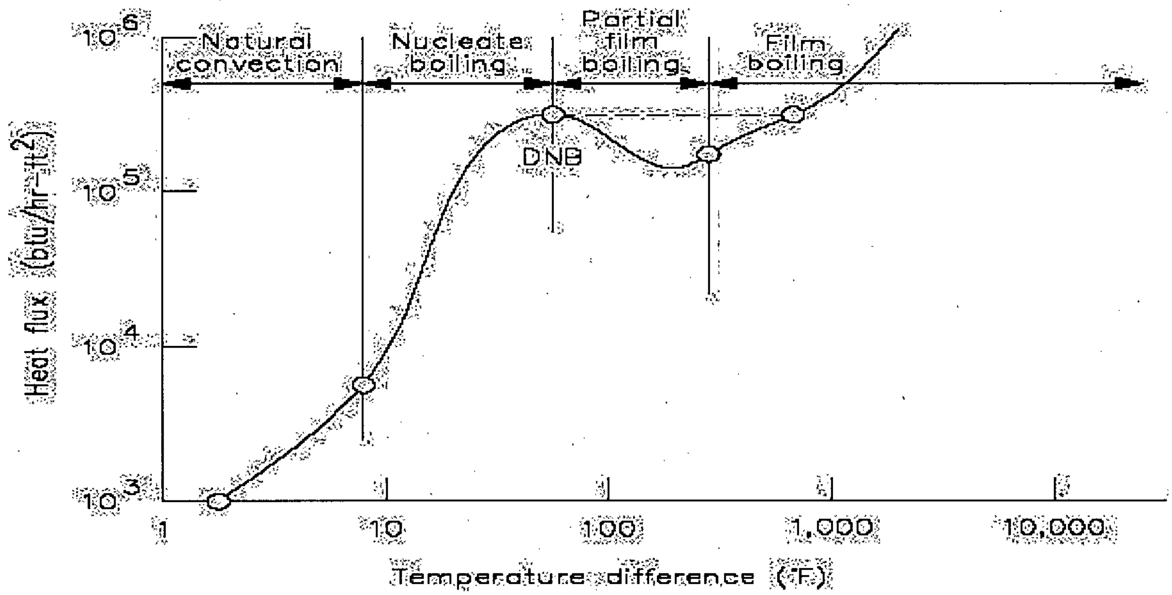


Figure 13 from DOE Fundamentals Handbook, Thermodynamics, Heat Transfer, and Fluid Flow, Volume 2 of 3

A PSU specific CHF analysis has not been performed. However, the CHF conditions for four other TRIGA reactors was analyzed in GA document "TRIGA Reactor Thermal-Hydraulic Study" TRD 070.01006.04 and can be compared to the Penn State Breazeale Reactor.

- MNRC (UC Davis) reactor has a hexagonal pitch like Penn State, but it is an enclosed core (less flow through the core).
- WSU and TAMU have partially open-sided cores like Penn State (which is open on all sides), but a square pitch of 1.530" yielding a channel flow area for the hot rod of 0.7390-0.7772in^2 (this gives less flow in the channel, PSU is 1.7" pitch and flow area of 0.8355in^2).
- OSU has top and bottom grid plate designs much like those at Penn State, but is enclosed on the sides by the reflector (lower flow into core overall).

The TRD 070.01006.04 CHFR results for the four reactors are summarized below:

		Hot Channel CHFR (at rated power)		
Reactor	**Rated Power**	**STAT (McAdams/Bernath)**	**RELAP (Bernath/Groenveld 1986/2006)**	**Minimum Power at CHF**
WSU	1.0 MW	4.03/3.41	**2.76**/5.68/3.50	**2.76** MW
OSU	1.0 MW	4.25/2.77	**2.36**/6.40/3.70	**2.36** MW
TAMU	1.0 MW	4.43/3.62	**2.87**/6.14/3.59	**2.87** MW
MNRC	2.0 MW	2.45/1.80	**1.75**/3.59/1.97	**3.50** MW

The GA document recommends Groenveld 2006 be used to analyze hexagonal pitch TRIGA reactors. Bernath is more limiting, so both are shown above.

The conditions for the Penn State reactor are less restrictive than those shown above due to the open-sided core and the larger channel size due to the hexagonal pitch, so the margin to CHF should be higher than any of those shown above.

The CHF issue is also addressed in the *Fundamental Approach to TRIGA Steady-State Thermal-Hydraulic CHF Analysis* –E.E. Feldman (Argonne National Laboratory-2007). Once again, the Penn State reactor is not specifically analyzed, but hexagonal pitch TRIGA reactors are analyzed in general. Different flow models are used to produce rod powers for the transition into Critical Heat Flux. Using the older General Atomics (GA) code STAT and the Bernath correlation, the lowest rod power that will cause a transition into CHF is 37.1kW. Using the recommended RELAP5 code and the Groenveld 2006 correlation, CHF occurs at 62.1kW.

Since the Technical Specification limit for MEPD at Penn State is 24.7kW, there is a 50% margin to CHF in the most conservative prediction, so no further analysis is warranted and the cladding will not exceed 500°C.

Regarding the question of a transient analysis (reactivity insertion accident), a Penn State specific CHF analysis for pulsing has not been performed.

General Atomics performed extensive pulsing experiments and analysis of TRIGA reactors. In *Fuel elements for Pulsed TRIGA Reactors* GA document E-117-393, Simnad and others conclude that for a pulse with a peak fuel temperature of almost 1000°C, the maximum cladding temperature only reaches 180°C at a peak heat flux of $0.0125 Kw/cm^2$. The figure below is from E-117-393.

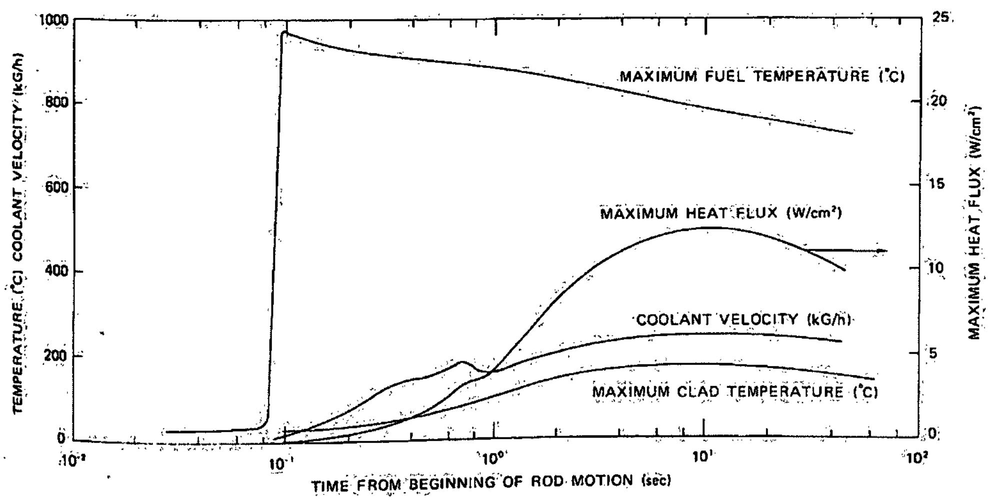


Fig. 15. Standard pulse hot-element at core edge—maximum temperature, heat flux, and coolant velocity versus time from first rod motion.

Figure 14 from GA E-117-393 *Fuel Elements for Pulsed Reactors* – Simnad 1976

The conclusions show relatively low heat flux and considerable margin for cladding temperature even for pulse events approaching the fuel safety limit. Therefore an additional PSU specific analysis is not warranted.

4.9 Core Configuration Control. Discuss any restrictions regarding reactor condition for fuel movement and explain the purpose of TS 3.2.5.

SOP-3 *Core Loading and Fuel Handling* provides guidance on core condition during fuel loading.

The following precautions are applicable to the question:

- The core neutron source shall be positioned so that the neutron detector measures core multiplication.
- The reactor shall be in STANDBY condition.
- The minimum count rate interlock may be defeated by momentarily pushing the LOW COUNT RATE INTERLOCK DEFEAT pushbutton.
- There shall be a minimum of three operable control rods in the reactor core.
- Anytime an element or group of elements is placed in a grid position adjacent to a control rod, that control rod shall be scrammed to check its operability before further operation is performed.
- Using adequate lighting, all elements loaded into peripheral positions in the core shall be visually examined for correct seating on the bottom grid plate as each element is loaded.
- The visual examination of the peripheral elements shall not be made from the reactor bridge, except in the case of elements that can be viewed using the TV camera and monitor.
- When the k_{eff} of the core is less than or equal to 0.99 with all control rods at their upper limit, the fuel may or may not be arranged in a close packed array. The source and detector shall be arranged such that the k_{eff} of the subcritical assembly shall always be monitored to assure compliance with $k_{eff} \leq 0.99$ when all control rods are fully withdrawn.

As noted above, SOP-3 requires the reactor be at "Standby" (defined as $4.50 to $5.50 of reactivity removed by control rods) to provide insertable reactivity in the event of an unexpected increase in count rate. TS 3.2.4 Reactor Safety System and Reactor Interlocks require that a source level interlock prevent rod withdrawal without neutron induced signal on the log power channel. TS 3.2.5 recognizes that during fuel loading/unloading source count rate may fall below the interlock setpoint preventing the withdrawal of control rods. TS 3.2.5 allows for momentary defeat of the interlock for control rod withdrawal to "Standby".

CHAPTER 5

5.1 Section 5.2, Primary Coolant System, Page V-1. In the first paragraph, which system is responsible for the 40 gpm recirculation of the pool water? At the bottom of page V-3, the last paragraph mentions a primary side flow rate of 400 gpm.

Section 5.2 Primary Coolant System briefly mentions that recirculation (40 GPM) along with natural circulation provide "some mixing of the pool water". This recirculation mentioned is a result of the Primary Coolant Cleanup System described in detail in Section 5.4. Cooling for the pool is provided by the Primary Coolant System which has a flow of 300 to 400 GPM.

5.2 Section 5.5, Primary Coolant Makeup Water System, Page V-7. What is the power source mentioned for the secondary heat exchanger pump that is independent of site electricity? No secondary pump is listed in Table 8-2 for equipment powered by the diesel generator.

The secondary coolant system pump(s) are located offsite (approximately 650 yards away at the University's waste water treatment plant) and are powered off the local power grid in that area. There is no installed backup power source for these pumps. The power supply is independent of facility power in that it is off different transformers but is not independent of the local power grid. Provisions exist at the secondary pump house to hook up external temporary power to pumps from a portable generator.

CHAPTER 11

11.1 The discussion in Chapter 11 of radiation sources of concern focuses almost entirely upon Argon-41, to the exclusion of other radionuclides. However, no mention is made of periodic confirmatory measurements of effluent to verify that Argon-41 is the only radionuclide being released. Provide a description of any confirmatory measurements regarding other radionuclides or justify why it is not needed.

With the exception of continuous air monitor operation, or specific monitoring designed for an experiment that might generate an effluent, no periodic confirmatory monitoring of airborne releases is conducted. Unusual indications on the air monitors have resulted in actions to analyze the cause (gamma spectrum analysis)

Any element that passes through or in the vicinity of the reactor core during operation may be activated by the high neutron flux levels. For this reason, engineering controls and Technical Specifications require a high degree of water purity to minimize unintended activation products that may result in loose surface contamination, release to the environment or increased radiation exposure to workers. Maintaining the pool water purity has historically prevented unintended activation, contamination, worker exposure and minimized environmental release. Water added to the pool is filtered through the purification system to prevent introduction of undesirable compounds that might result in release.

Any solid wastes (effluents) are packaged and disposed of consistent with NRC regulations.

Any liquid releases (if conducted - liquid is typically evaporated as discussed in Section 11.1.1.2) would be sampled, analyzed and transferred to the PA Broadscope license prior to release.

Section 11.1.1 Radiation Sources identifies multiple possible release sources and each source is addressed. Much discussion is focused on Argon-41 due to its prevalence in operation, half-life, and percentage of release. Specific Technical Specifications requirements are in place to evaluate and control the generation and release of Argon-41. The facility undertakes multiple activities to evaluate and minimize the release of Argon-41.

New experiments that might off-gas or generate a release are evaluated for impact as part of the Experiment Authorization. During experiments that may generate gaseous release, additional monitoring may be implemented.

Absent an accident scenario or introduction of a contaminant to the reactor pool through an experimental process, Argon-41 remains the major release isotope of concern.

11.2 Section 11.1.4 states the survey equipment that is available and Section 11.1.6 mentions that unannounced radiation and contamination surveys are conducted, but neither section mentions the minimum frequency of such surveys (i.e., quarterly, annually). Specify the minimum survey frequency for the controlled areas of the PSBR along with the basis for the minimum survey frequency.

There is no internal procedural requirement for unannounced independent surveys by Environmental Health and Safety (EHS).

EHS radiation safety personnel perform unannounced radiation and contamination surveys of the facility with a frequency that varies by location and needs. The most regular survey performed by EHS is a (usually) weekly contamination and radiation survey of the facility. This survey includes areas throughout the whole building and the specific locations change slowly with time. The standard frequency for this survey is weekly, but due to other work issues probably only 48 - 50 are done a year. The chosen frequency and locations are based upon "good health physics practices," the results of the RSO's twenty years of experience at PSU, and changing research and vendor support activities at the facility

These surveys are in addition to the surveys performed after each use of un-contained radioactive material that are performed by the radioactive material user.

Additionally, operating procedures dictate that contamination surveys are performed daily (Monday through Friday working days) by the facility staff in multiple in the facility. Permanently installed radiation monitoring is also required to be operational per Technical Specifications.

11.3 Tritium is an activation product that is generated in the D_2O Thermal Column and is monitored periodically. Section 11.4 does not mention survey or monitoring methodology or frequency for tritium. Describe the tritium monitoring methodology and frequency or justify why it is not needed.

Operating procedures dictate monthly samples of the D_2O tank. The D_2O tank sample is mixed with liquid scintillation fluid and counted in a liquid scintillation system with comparison to a known standard.

11.4 No mention is made of the frequency or criteria for radiation surveys for posting in beam areas. Describe the minimum frequency or criteria for radiation surveys in these areas.

The Neutron Beam Laboratory has a permanently installed gamma monitoring system which is required to be operable by TS 3.6.1 Radiation Monitoring Information. This monitor will activate the Building Emergency Evacuation Sequence if the setpoint is exceeded. The Beam Port 4 neutron beam is not accessible to humans during reactor operation. Interlocks will shutdown the reactor if the cave door is opened (neutron beam port 4 has a large shield structure know as the "beam cave"). The SRO has administrative key control over the beam cave. Prior to entry into the beam cave following an irradiation, a SRO will move the reactor away, unlock the cave and survey the enclosure for radiation hazards prior to allowing experimenters to enter the cave. Access to the Beam Port 7 neutron beam is prevented by permanently installed and locked test equipment and shielding. As noted in SAR Section 11.1.6, unannounced radiation and contamination surveys are conducted independently by EHS.

11.5 The Controlled Area and Restricted Area as defined in 10 CFR 20.1003 are not defined in the SAR. Describe the boundaries of the Controlled and Restricted Areas at the PSBR.

From 10 CFR 20.1003: *"Restricted area means an area, access to which is limited by the licensee for the purpose of protecting individuals against undue risks from exposure to radiation and radioactive materials."*

By the definition in 20.1003, PSU has only temporary restricted areas. For example, during some evolutions personnel are restricted from entering the reactor bay to minimize their exposure and to minimize distractions and exposures to operators. These restrictions are normally lifted within an hour. The neutron beam lab is a restricted area when it is posted as a high radiation area. There is no purpose at this facility for a permanent restricted area as defined in 10CFR20.1003.

From 10 CFR 20.1003: *Controlled area means an area, outside of a restricted area but inside the site boundary, access to which can be limited by the licensee for any reason."*

In the sense of the Controlled Area defined in 10CFR20.1003, the area within the facility fence is always controlled by RSEC staff. [redacted]

[redacted]

11.6 Chapter 11 does not discuss radiological access control to the building. Describe how access control for radiological areas of the building is accomplished.

[redacted].

All visitors granted access at the fence boundary must report directly to the lobby to sign in. Individuals or groups of individuals are issued electronic dosimetry for educational and monitoring purposes. Personnel going beyond the lobby are required to be badged and have issued dosimetry or electronic dosimetry. All areas of the building containing radioactive material or radiation areas are locked. [redacted] Temporary radiation areas are roped off and placarded, temporary high radiation areas are locked or attended.

11.7 Chapter 11.5 mentions the use of personal dosimetry for those individuals required to be monitored. However, no mention is made if the dosimetry is National Voluntary Laboratory Accreditation Program (NVLAP) certified as required by 10 CFR 20.1501(c). Confirm that personal dosimetry used at the PSBR is NVLAP certified appropriate for the radiation encountered at PSBR.

Penn State complies with 10 CFR 20.1501(c) and uses a NVLAP contract dosimetry supplier.

11.8 The annual doses on the area dosimeters are lower than natural background rates, implying that a correction for natural background is being made. Describe this correction and how was it determined.

The Penn State contract dosimetry supplier follows the standard practice of reporting the net exposure for personal and environmental monitoring dosimeters by subtracting off the exposure received by the control dosimetry from the exposure received by the individual dosimeter. This includes exposures received by dosimeters in transit from the vendor to Penn State and back to the vendor. The exposures reported on these dosimeters do not include natural background radiation.

11.9 Chapter 11 does not mention supplemental dosimetry for multi-badging use such as ring badges. Describe if supplemental badges are available for use.

Supplemental dosimetry is supplied on an as needed basis. Ring dosimeters are issued to, and required to be worn by, individuals who handle radioactive material in sufficient quantities that would indicate the possibility of the person exceeding 10% of the annual extremity limit.

11.10 Section 11.1.5 indicates that personal dosimeters are mounted in select locations within the facility to monitor those areas. Describe the provisions made in the processing routines for these "non-personal" dosimeters that take into account their use in this manner or justify why such provisions are not needed.

The area dosimetry monitors are mounted in representative locations for information gathering purposes and are available to use in reconstructions of exposures -- although they never have been needed for that purpose. Based on prospective and retrospective analysis of facility exposures, only about six individuals at PSU would require dosimeters at this time.

According to a representative from the dosimetry provider, "area monitors should be identical to the whole body dosimeters that are being worn by the workforce. These dosimeters will provide good estimates of the occupational dose. The accuracy of the estimate can be improved if the dosimeters are placed on phantoms or plastic blocks to mimic the backscatter from a human body but this is really only helpful for albedo neutrons dosimeters or low energy photons fields. If the client fields are medium to high energy photons the phantom will have little effect." Since the radiation types expected to result in individual exposure do not fall into these types, and the area monitors are used only for historical trending, the bare dosimeters provide an adequate measurement of exposure in the areas measured.

11.11 Chapter 11 does not mention the use of "engineering controls" or minimization efforts for control of contamination. Describe how these factors are incorporated in the PSBR radiation protection program.

Specific engineered controls to minimize the spread of contamination in the reactor facility include the TRIGA fuel design and operating limits that prevent fuel element service failure and the purification system and coolant operational/Technical Specification limits that virtually eliminate radioactive material in the pool water and eliminate the pool as a source of contamination. Additionally engineering controls are well integrated into PSU's radiation safety program. Procedures and processes are designed to minimize the direct handling of radioactive material as much as reasonably achievable. Administrative controls are in place to ensure proper encapsulation of samples for exposure to the core and dry runs are conducted and continuous quality improvement initiatives are applied to situations in which risks of exposure or spread of contamination are reasonable.

11.12 Chapter 11 indicates that all persons using radioactive material or persons who are monitored receive appropriate Radiation Protection Office (RPO) training. The discussion does not mention the period of time before refresher radiological training is required. Describe the period of time that RPO training is valid before retraining is required.

For operators working under the R-2 license, there is a regular and detailed bi-annual retraining plan approved by the NRC. All individuals, including those under the R-2 license receive annual refresher training in accordance with PSU's Pennsylvania broadscope license.

CHAPTER 13

13.1 Section 13.1.A. TRIGA Fuel Temperature Analysis of the PSBR. Given all of the assumptions and uncertainties in deriving Equation (35), i.e., maximum clad temperature of 140±10°C, axial peaking factor, A_o & B_o factors, Δ_{tg}, experimental measurements, measured-to-peak factor of 1.6, temperature coefficient, initial pool temperature, correlation uncertainty, etc. What is the overall uncertainty in the maximum fuel temperature estimates provided by Equation 35 (or similar equations for other instrumented fuel elements)? Discuss the uncertainties in individual parameters used in deriving Equation (35) as necessary to establish the overall uncertainty and the corresponding safety margin.

The equations used in the SAR for determining the measured fuel temperatures are:

(33) I-14 Unburned 12w/o element at steady state 1MW full power
(34) I-14 Unburned 12w/o element for pulsing
(36) I-13 Burned (2.2 MW-days) 12w/o element at steady state 1MW full power
(37) I-13 Burned (2.2 MW-days) 12w/o element for pulsing

Equation (35) is just another form of equation (34). The inherent uncertainty in these equations can be determined by comparing the calculated values to those values measured during the work leading up to the writing of the SAR and is contained in Table 13-2.

Steady State Analysis:

Fuel Element	Core Position	NP (SS)	SS 1MW Meas	SS 1MW Calc	% Deviation
I-13	G-8	1.56	412	411	0.12%
I-13	G-8	1.56	411	411	-0.12%
I-13	G-8	1.56	411	411	-0.12%
I-13	G-8	1.56	411	411	-0.12%
I-13	G-10	1.39	381	382	-0.24%
I-13	G-10	1.39	382	382	0.02%
Fuel Element	Core Position	NP (SS)	SS 1MW Meas	SS 1MW Calc	% Deviation
I-14	G-8	2.01	455	467	-2.6%
I-14	G-8	2.01	466	467	**-0.2%**
I-14	G-10	1.84	372*	439	-18.1%*
I-14	G-10	1.84	418*	439	-5.1%*
I-14	G-10	1.84	450	439	**2.4%**

The steady state predictions are within 2.4% for new elements and 0.3% for used elements. * Note that the measured values 372 and 418°C for I-14 were prior to pulsing. The later measurements were performed after the element was conditioned by many pulses. I-13 had already been conditioned by pulsing.

Pulse Analysis:

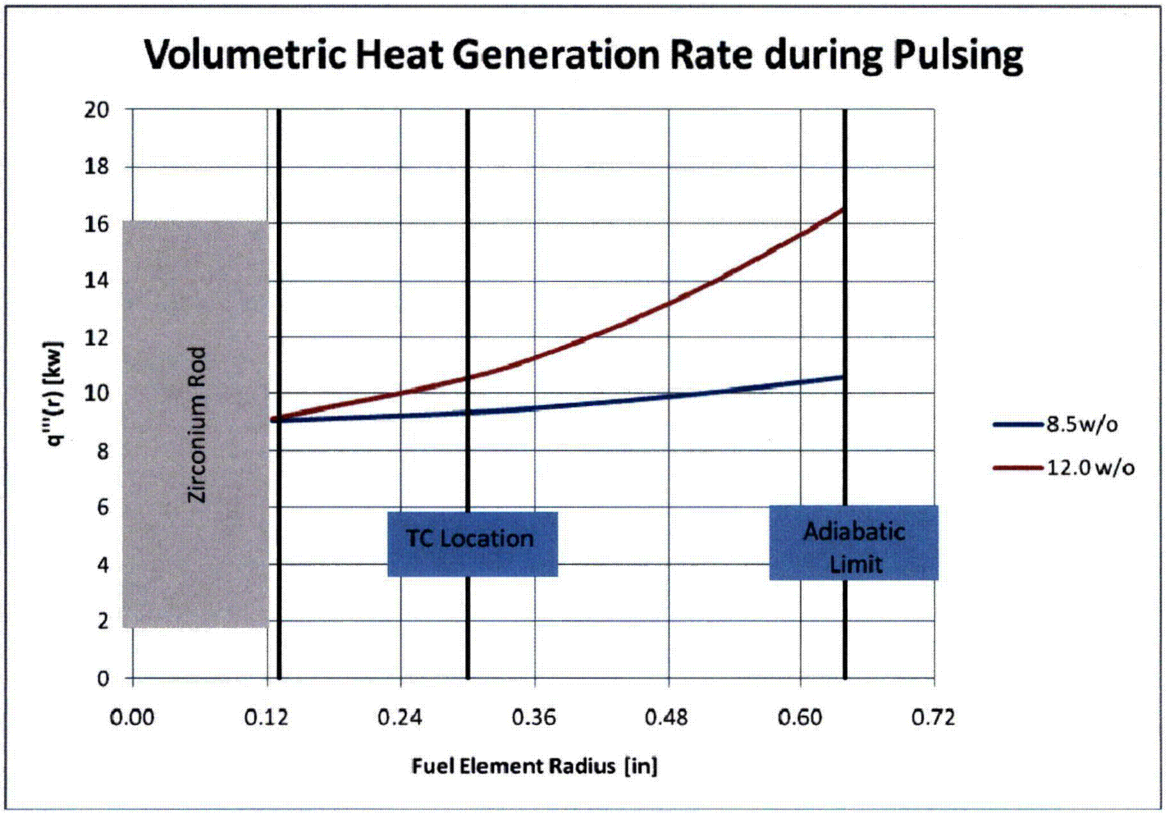
Fuel Element	Core Position	NP (pulse)	$2.75 Pulse Meas	$2.75 Pulse Calc	% Deviation
I-13	G-8	1.62	509	443	12.9%
I-13	G-8	1.62	511	443	13.2%
I-13	G-8	1.62	511	443	13.2%
I-13	G-10	1.54	453	422	6.7%
I-13	G-10	1.54	453	422	6.7%
Fuel Element	Core Position	NP (pulse)	$2.75 Pulse Meas	$2.75 Pulse Calc	% Deviation
I-14	G-8	2.07	517	518	-0.1%
I-14	G-8	2.07	518	518	0.0%
I-14	G-10	1.8	456	453	0.7%
I-14	G-10	1.8	466	453	2.8%

The deviations for the burned element I-13 are large in comparison to the unburned element I-14. This is explained in the SAR as uncertainty in the gap temperature and the exact burn-up effect on the power distribution in the element.

Since the Penn State reactor has set its Limiting Safety System Setting at 650°C, 500°C below the Safety Limit, all of the uncertainty is captured in this margin. If we assume a maximum measured temperature of 650°C and the maximum measurement uncertainty of 13.2%, the maximum temperature at the thermocouple location would be only 736°C, over 400°C below the safety limit. For steady state, the same 650°C maximum temperature with the maximum uncertainty of 2.4% would yield a maximum temperature at the thermocouple location would be only 666°C, 484°C below the safety limit.

13.2 Section 13.1.A, TRIGA Fuel Temperature Analysis of the PSBR. Explain how the measured-to-peak fuel temperature factor of 1.6 for pulses is derived from the profile described by Equation 4 and the parameters in Table 13-1.

The ratio of peak-to-measured temperature during a pulse can be determined by using equation (4) from the SAR. The values for new 8.5 & 12.0 w/o fuel elements are shown in the figure below.



Levine's paper *Temperature Behavior of 12w/o U TRIGA Fuel* (reference 3) states that:

"If a flux depression of this magnitude actually occurs within the 12w/o fuel, the temperature near the surface of the fuel (maximum fuel temperature during a pulse) would be approximately 1.6 times that measured. The 1.6 increase assumes that adiabatic conditions hold to 89% of the fuel radius."

This behavior is shown in Figure 14 from the document GA-6216 *Characteristics of Large Reactivity Insertions in a High Performance TRIGA U-ZrH Core*. It shows that the peak temperature is at approximately 89% of the fuel radius immediately following the pulse.

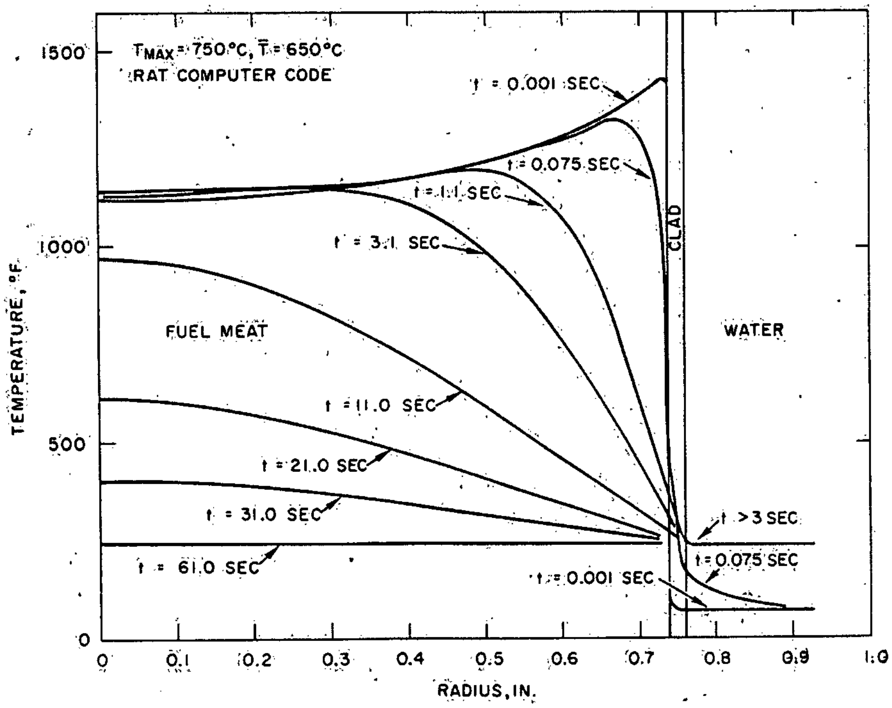


Fig. 14—Temperature distribution in fuel meat following pulse

Figure 14 from GA-6216 *Characteristics of Large Reactivity Insertions in a High Performance TRIGA U-ZrH Core*

13.3 Section 13.1.A, TRIGA Fuel Temperature Analysis of the PSBR. How is the temperature performance for new fuel batches determined? Does each new batch contain one or more instrumented fuel elements that undergo a calibration scheme? Is a most limiting instrumented fuel element selected from those available?

No specific tests are performed to determine the temperature performance of a new fuel batch (meaning shipment or manufacture run). The fuel performance in a new batch of elements is not tested independently, but rather as a part of a new core loading. Each new core loading is modeled using a set of proprietary computer codes (that have been benchmarked against a known core loading) to predict control rod worth, excess reactivity and normalized power. The results are compared to previous core loadings and the Technical Specifications for compliance. New fuel elements are loaded into a new core design conservatively to avoid flux and temperature peaking. The instrumented fuel elements are usually ordered with a new batch of fuel, but it is not a requirement. There is no calibration scheme beyond the in-core measurements and comparison to expected (and predicted) and historical parameter values. New instrumented elements are not assembled and irradiated unless needed to replace the in-use instrumented assembly.

13.4 Section 13.1.A, TRIGA Fuel Temperature Analysis of the PSBR, Page XIII-17. How does the data in lines 9 & 10 of Table 13-2 demonstrate the increase in Δ_{tg} diminishes to zero?

The phenomenon of plastic deformation of the fuel due to pulsing is well recognized in the TRIGA reactor community. General Atomics discusses an experiment that they performed in *GA-6216 Characteristics of Large Reactivity Insertions in a High Performance TRIGA U-ZrH Core-1965 (pp 30-32)*. This was 304 stainless steel clad 8.5 w/o fuel elements, like the Penn State reactor. The Penn State reactor also has 12.0w/o fuel elements. The performance of these elements under pulsing was evaluated by Levine, Geisler and Totenbier at Penn State (*Temperature behavior of 12w/o Uranium TRIGA Fuel*). Their work formed part of the basis of the current Safety Analysis Report (SAR). Both works show an increase in fuel temperature in an unused fuel element after pulsing. The fuel temperature increases asymptotically for pulses of the same magnitude to a limit after 10-20 pulses. The temperature will increase again if the pulse reactivity is increased above the previous pulses. Once the new fuel element has been pulsed at the maximum for 10-20 pulses, the temperature will no longer increase. This behavior is consistent with temporary swelling of the fuel and the ensuing permanent plastic deformation of the cladding forming a gap between the fuel and cladding where none was present. Penn State "conditions" new fuel elements in this manner to help ensure that fuel temperature behavior is consistent over core life.

This behavior can be seen in Figure 16 from GA-6216 shown below.

The pulses in Table 13-2 of the SAR (lines 9-11) show the initial temperature of I-14 at 372°C moving to 450°C after a series of \$2.00-\$2.75 pulses. This behavior is in line with that of the fuel elements that were tested to develop the data shown in Figure 3 below. The temperature for I-14 increased by a decreasing amount for each set of pulses. After the first set, the temperature went from 372-418°C or 12%. The second change was 7%, the third was 2%. Figure 4 below shows that the change in temperature due to repeated pulsing is not great after the first set of pulses are performed.

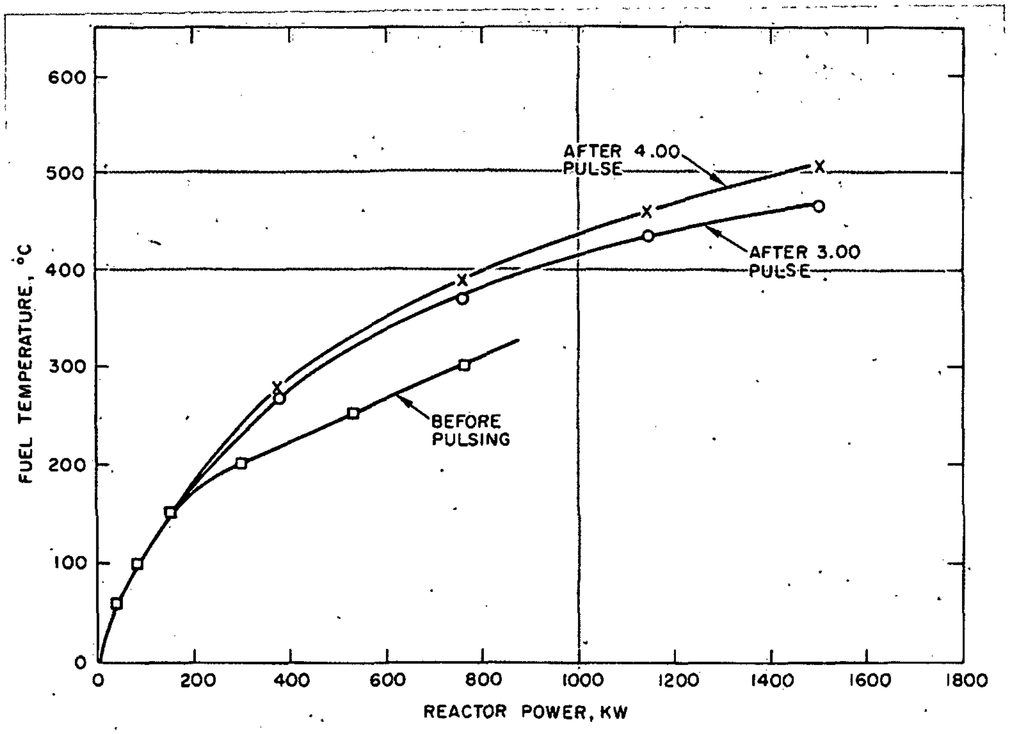


Fig. 16—Fuel temperature to obtain a given steady state reactor power as a function of transient size performed on fuel

Figure 16 from GA-6216

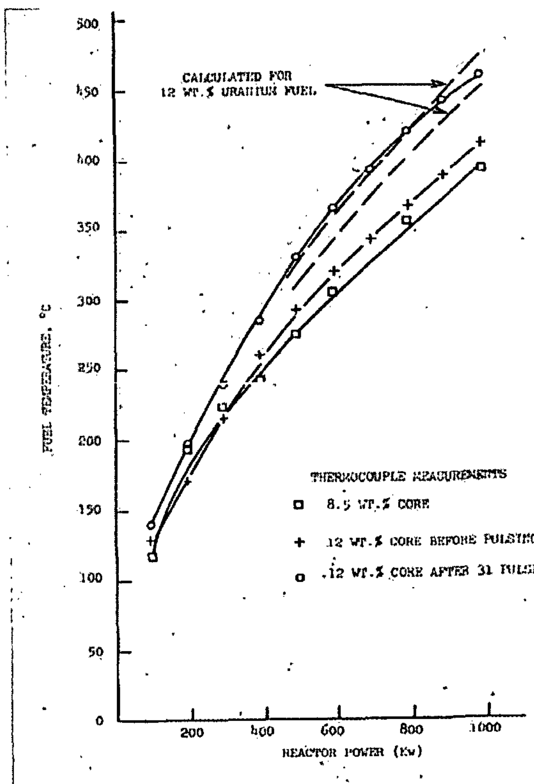


Figure 3. STEADY STATE FUEL TEMPERATURE VS. POWER LEVEL

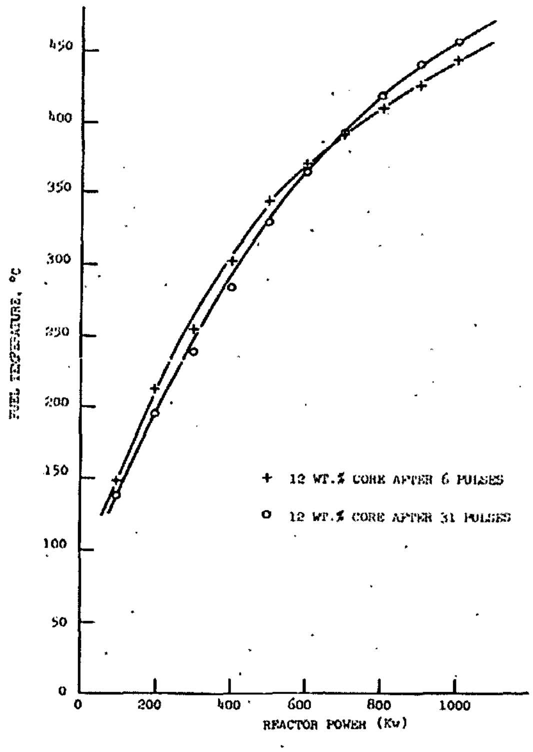


Figure 4. STEADY STATE FUEL TEMPERATURE VS. POWER LEVEL AS AFFECTED BY PULSING

Figures 3 and 4 from Levine *Temperature Behavior of 12w/o Uranium TRIGA Fuel*

13.5 Section 13.1.A, TRIGA Fuel Temperature Analysis of the PSBR, Page XIII-17. The equation at the bottom of page XIII-17 uses a t_{tc} of 445 °C for element I-14 loaded in core position G-8. Table 13-2 lists a t_{tc} of 455 °C for element I-14 loaded in core position G-8. Clarify which is the correct temperature.

The original data sheets are not available, but solving the equation at the top of page XIII-17 using 445°C yields $NP_j = 2.02$ as shown in the text. The position of the RSEC staff is that, barring finding the original data sheets showing information to the contrary, 445°C is the correct temperature.

In addition, since the temperature in question was taken prior to pulsing, the conditions to reproduce it no longer exist. The temperature itself is only useful for determining NP for I-14 in G-8 in Core 36 and therefore for determining the temperature drop across the fuel-cladding gap. The gap temperature drop is used to predict fuel temperatures using I-14 as a standard fuel element in any core. This performance has been verified elsewhere in the SAR.

Corrected Table 13-2

Fuel Temperature Measurement Data for Loading 36
T_0 = 21°C

			t_{po}(°C) Recorder / Meter			
Fuel Element	Core Position	t_{tc}(°C) SS 1MW	Pulse $2.00	Pulse $2.25	Pulse $2.50	Pulse $2.75
I-13	G-8	412	353/379	392/421	436/467	478/509
I-13	G-8	411	---	---	---	---
I-13	G-8	411	343/381	387/421	431/461	478/511
I-13	G-8	411	350/381	389/419	435/466	478/511
I-14	G-8	**445**	389	427	468	517
I-14	G-8	466	395	434	482	518
I-13	G-10	381	323/333	359/371	399/412	430/453
I-13	G-10	382	311/332	357/373	400/416	439/453
I-14	G-10	372	339	375	415	456
I-14	G-10	418	---	---	---	---
I-14	G-10	450	348	391	425	466
I-14	G-10	433	342	373	411	449

13.6 Section 13.1.A, TRIGA Fuel Temperature Analysis of the PSBR, Page XIII-22. The maximum fuel temperature of 1095°C in the first paragraph is calculated from Equation (35) using a T_o = 21°C. Describe any restrictions on the initial pool temperature during pulse mode operation to ensure the calculated 1095°C is a conservative maximum?

The pool temperature provides a starting temperature for the fuel and is usually discounted in dealing with temperature increases due to reactor operation. In Equation (35) the pool temperature is added to the temperature increase due to pulsing. On page 22, the temperature of 1095°C is determined by multiplying the final measured pulse temperature by the internal fuel element correction factor of 1.6 (due to location of the fuel thermocouple). The more correct but less conservative approach would be to multiply the only the fuel temperature increase by 1.6 and add the pool temperature. There is no reason to think that the fuel at zero power multiplies the pool temperature by 1.6, so there is no reason to think that it does so at power. The internal temperature due to pulsing should be corrected by 1.6 only.

The result is a temperature difference due to the pulse described on page 22 ($3.50 pulse on core 36 with a maximum NP =2.2) of 665°C.

$$t_{poj} - T_{pool} = \left(72.2 * dk_p + 0.588\right) * \frac{t_{tcj} - 140°C}{C_f}$$

$$t_{poj} - T_{pool} = (72.2 * 0.007 * 2.5 + 0.588) * \frac{499 - 140°C}{1}$$

$$t_{poj} - T_{pool} = 665°C.$$

The maximum temperature anywhere in the element (I-14) is given by:

$$t_{poj} * (1.6) - T_{pool} = 665°C * 1.6 + T_{pool} = 1064°C + T_{pool}$$

This shows that pool temperature could be as high as 86°C before the safety limit was approached.

Pool temperature is limited by Technical Specifications (3.3.6) to 60°C.

$$t_{poj} * (1.6) - T_{pool} = 665°C * 1.6 + 60°C = 1064°C + 60°C = 1124°C$$

Therefore, no additional restriction on pool initial temperatures need be applied.

13.7 Section 13.1.A, TRIGA Fuel Temperature Analysis of the PSBR, Page XIII-22. Is Equation (28) referred to in the 2nd paragraph the correct reference or should it be Equation (35)?

A typographical error exists in the SAR and the sentence should refer to Equation 35.

The paragraph should read:

> Thus, in the future, Equation (35) can be used to evaluate and predict t_{poj}. This requires placing I-14 in the hottest spot in the core and running at 1MW to evaluate t_{tc}. Then starting with a \$2 pulse, verify Equation (**35**) and predict t_{poj} for the high values of δk_p. The t_{poj} related to a \$2 pulse will be more than 100°C below t_{poj} for a \$2.75 pulse and even much lower than that for a \$3.50 pulse. ..

13.8 Section 13.1.A, TRIGA Fuel Temperature Analysis of the PSBR, Page XIII-24. Should the second line in Table 13-6 be position G-10?

A typographical error exists in the SAR and the table should read as shown below.

Table 13-6
Evaluation of NP_j's from I-13 Data
I-13 (2.2MWD depleted)

Core Position	t_{tc} [°C]	NP_j Steady State Equation (36)	NP_j (Average) Pulse Equation (37)
G-8	411	1.56	1.62
G-10	382	1.39	1.54

For comparison, see I-14 data in Table 13-3.

13.9 Section 13.1.B, Evaluation of the LSSS, Page XIII-25. In the last paragraph, the maximum fuel temperature for a \$3.50 pulse is evaluated as 1095°C using Equation (34) for element I-14 and a NP of 2.2. Provide a similar calculation for element I-15 showing the corresponding equation and values for element I-15.

The instrumented fuel element I-15 has approximately 200% of the burnup of element I-13 as of 2008. I-16 is the instrumented element that feeds the safety system. The burnups are shown below.

Instrumented Fuel Element	**Current Burnup [MWD/MTU]**	**Last Core Loaded**
I-13	[redacted]	Core 48A (1998)
I-15	[redacted]	Core 53A (2008)
I-16	[redacted]	Core 53A (2008)

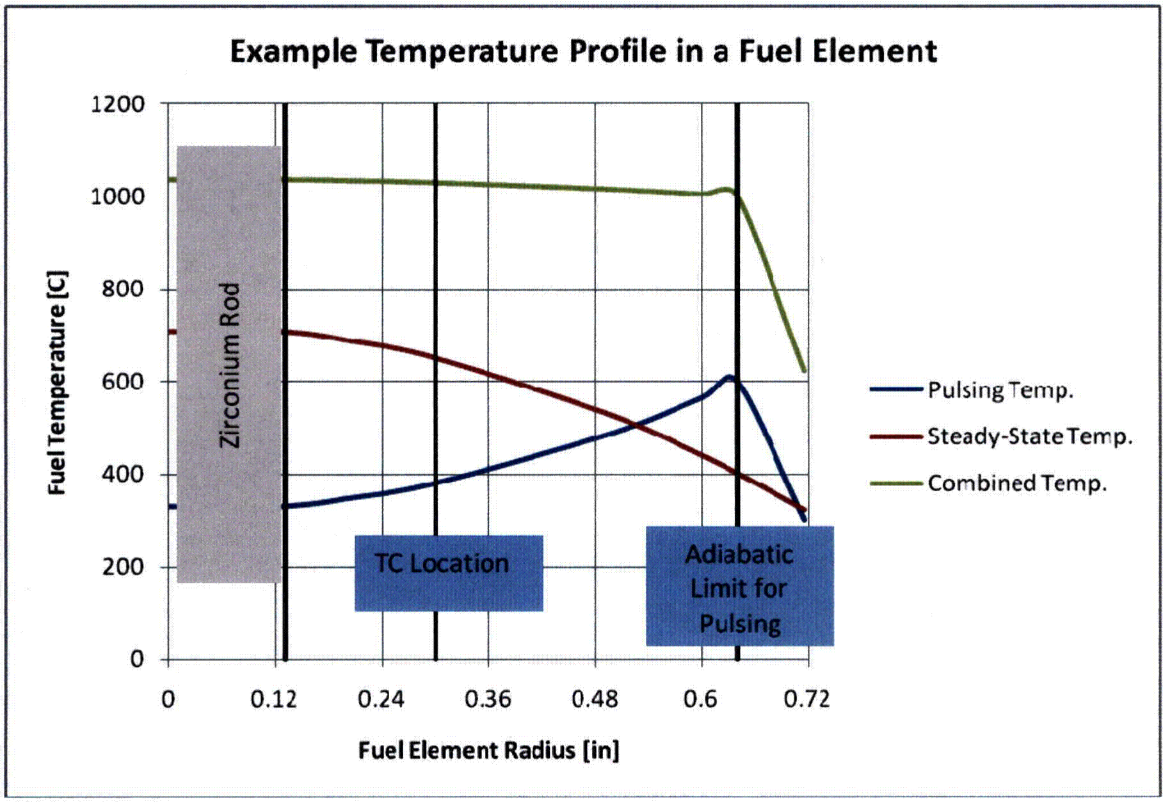
The equation used for I-13 in the SAR is

$$t_{poj} = 1.475x10^4 * NP_j * dk_{pulse} + 80 * NP_j + T_0 \quad (37)$$

This was developed using equation (4) and different shape coefficients for the radial power shape. Plotting this flatter power shape shows a peak-to-measured fuel temperature during a pulse of 1.1 - 1. This is much lower than the 1.6-1 for a fresh element. The maximum fuel temperature anywhere in the element is highest for the lowest burnup elements due to the extra peaking. Performing the calculation in Section 13.1.B, Evaluation of the LSSS, Page XIII-25, would yield (for I-13 or I-16) 842°C. The maximum temperature for I-15 should be even lower since there is considerably more burnup and therefore an even flatter power shape.

13.10 Section 13.1.2, Insertion of Excess Reactivity, Page XIII-33. Provide a more detailed explanation of how the data for the maximum measured $2.25 pulse temperature for element I-15 and Core Loading 47 was used to calculate the maximum fuel temperature for the reactivity insertion accident at an initial power of 1.15 MW. What is the NP for the location of element I-15 in Core Loading 47? Is the reactivity insertion accident based on the TS NP limit of 2.2 and maximum elemental power density of 24.7 kW?

The two temperature profiles (pulse and steady state) are assumed to be additive. Since the shapes of the profiles are somewhat opposite, the resulting combined profile is lower than adding two profiles of similar shapes. The figure below shows an example of the phenomenon. The precise shapes of the profiles are only approximated and do not represent any specific element or core loading. The figure shows only one possible result of the phenomenon with a measured pulse peak temperature of 380°C and a measured steady state temperature of 650°C. The right end of the plot shows the edge of the interior of the fuel meat and does not include the cladding or the gap. The temperature drop for pulsing outside of the adiabatic limit is shown for illustration only.



I-15 in core 47 was in position G-8, the same as I-13 in Core 36. The cores were similar in size (Core 36 had 92 fuel elements and Core 47 had 94 fuel elements) and I-15 and I-13 were both well burned 12w/o elements. Table 13-6 in the SAR gives I-13's NP in G-8 as 1.56 for core 36. This is a suitable estimate for I-15 in G-8 in core 47 since the fuel loadings and locations are similar.

The analysis in the SAR is not based on either the MEPD of 24.7kW/element or the NP limit of 2.2. The instrumented element used for the measurements for Core 51 and all other pulse measurements in all other cores is in the position of MEPD (Technical Specifications allows for a different location, but adjustments to the analyses must be made) and maximum NP since Penn State uses a 12w/o instrumented element for safety channel monitoring. Instead, the analysis is based on actual core performance for very limiting core conditions (i.e. most reactive core loaded since 1995). This analysis was included in the SAR only as an example of the robustness of the TRIGA fuel design. The SAR discusses the reasons why this type of event is highly unlikely at the Penn State reactor.

The following analyses are included as additional examples of the stability of the fuel using more recent core designs and parameters.

Core 51 (2000) was the most reactive core in recent years and can be considered a maximum as long as Penn State has a thermal column that adds positive reactivity. It also had the most reactive Transient Rod since 1995. The parameters for Core 51 are shown below:

Core 51 (2000) Parameter	**Value**
Control Rod Worth	$13.67
Critical Rod Worth	$7.14
Excess Reactivity (cold & clean core)	$6.53
Shutdown Margin	$2.46
Worth of Transient Rod	$3.08
Projected Measured Fuel Temperature at 1.15MW	535°C
Projected Reactivity Loss at 1.15MW	$4.85
Peak Measured Pulse Temperature at $3.08	465°C

If the reactor could pulse from 1.15MW with the full worth of the Transient Rod, the two temperatures would be added to yield a final maximum temperature of approximately 1000°C. This would require and excess reactivity of $4.85+$3.08 = $7.93, which is far beyond the Technical Specifications limit of $7.00 The actual value is always lower due to the positive reactivity of the thermal column.

For a limiting analysis using a NP = 2.2, the partially burned element I-16 (should perform similarly to I-13 in the SAR) produces the hottest temperatures. Equation (37) from the SAR is used for this calculation. There is no reference power defect for 1.15MW. Since Core 51 was high reactivity core, those parameters can be used. There are two cases that can be considered using the Core 51 data. The first case is a pulse of full worth ($3.08) from the highest power that can be achieved with three rods (TR on the bottom). The second case is starting from 1.15MW and pulsing with as much worth as is left in the TR (assume a full $7.00 of excess reactivity). Both cases are prohibited by interlocks and procedures. The second case is physically improbable if not impossible.

Case 1:
Excess Reactivity – TR Worth = $6.52-$3.08 = $3.45
Reactor Power at $3.45 = 750kW
Fuel Temperature at 750kW = 430°C
Peak Pulse temperature for I-16 at NP=2.2 and $3.08 = 670°C
Final Fuel temperature (sum of 1MW SS and pulse) = 1100°C

Case 2:
Pulse reactivity remaining (1.15MW = $4.85) = $7.00-$4.85 = $2.15
Fuel temperature at 1.15MW = 535°C
Peak Pulse temperature for I-16 at NP=2.2 and $2.15 = 458°C
Final Fuel temperature (sum of 1MW SS and pulse) = 993°C

Both cases are below the safety limit for the fuel.

13.11 Section 13.1.3, Loss of Coolant, Page XIII-34. Provide an estimate of the radiation doses from a loss-of-coolant accident outside the Controlled Area.

The Loss of Coolant Accident as described in the facility SAR analyzes a loss of pool water [redacted]. The pool drains [redacted] and no operator action is assumed. The closest uncontrolled area is the fenceline to the north of the reactor pool. The fence is about 100 feet from the core in its normal location at the R1 position in the south half of the reactor pool. The exposure rate at this point was calculated using MCNP 5.0 and checked by hand using an analytical method as described by Foderero in the *Photon Shielding Manual(1976)*. The MCNP calculations were higher, so they will be used here.

Three scenarios are shown in the figures below. The first case is the activity in the core and related exposure rate at the fence (following a LOCA) for a power history for 168MWH/week for the week prior to the LOCA. This is far beyond what is possible given an excess reactivity limit of $7.00 due to xenon poisoning. The second case is for 40MWH/week. This is probably a practical limit for operations considering fission product poisoning. The month with the highest usage in the last four years was July 2008 with a weekly average of 25MWH/week. The average use is 14MWH/week. The third case is for 20MWH/week. This is an appropriate case for the way the Penn State reactor tends to operate since greater than ninety-five percent of all months are below this level of operation. Core activity is calculated using a method found in McClellan facility SAR.

[redacted]

[redacted]

13.12 Section 13.1.7, Loss of Normal Electric Power, Page XIII-44. Assuming the reactor is operating, describe if and how the reactor would shutdown on loss of on-site electrical power with the diesel generator functioning, and without the diesel generator functioning. How does loss of power to the facility exhaust system, emergency exhaust system, or the continuous air monitors cause a shutdown?

If the reactor is operating and a loss of power to the facility occurs, the UPS will power the critical reactor safety and instrumentation systems (including the radiation monitor system). No automatic scam is initiated by a loss of facility power.

The facility exhaust fans, emergency exhaust fans, and the continuous air monitor pumps receive backup power from a standby facility diesel generator. The diesel was installed to provide fire system and emergency lighting supplies. With the availability of excess capacity on this diesel, the reactor UPS and other important loads were added (normal and emergency ventilation, air monitor pumps). These capabilities are not assumed nor relied upon to continue operation in the case of loss of site power.

On a loss of facility power, DCC-X will initiate a scram if it senses loss of both facility exhaust system fans (determined by position switches on the fan louvers). If the diesel re-powers the fans before the louvers close on both fans the reactor will continue to operate and operator action to shutdown the reactor is dictated by procedure.

On loss of power to both facility exhaust fans, DCC-X will initiate a reactor scram when it senses the louvers are closed.

Loss of power to the emergency exhaust alone would cause no automatic action; operator action to comply with the Technical Specification limits would be required.

The continuous air monitor instrumentation is powered from UPS. The air pumps are powered from the diesel backed distribution. Loss of power to the air pumps alone would require operator action to comply with the Technical Specification limits.

Questions Related to Financial Qualifications and Decommissioning

Pursuant to 10 CFR 50.33(f)(2), "applicants to renew or extend the term of an operating license for a nonpower reactor shall include the financial information that is required for an initial license." To comply with this requirement, please provide the following updated and supplemental information to the 2005 Pennsylvania State University (the University) application for a renewed license for the PSBR.

1. Under 10 CFR 50.33(d), certain information is required by an applicant, the University, as applicable. The application states that the University is a non-profit university, organized under the laws of the Commonwealth of Pennsylvania. To comply with 10 CFR 50.33(d), please state the organizational form of the University (e.g., corporation) and if a corporation provide the information required under 10 CFR 50.33(d)(3). If none of the provisions of 10 CFR 50.33(d) are applicable, please so state.

None of the business descriptions listed in 10CFR50.33(d)(3) are exactly applicable. The Pennsylvania State University was originally chartered by an act of the Legislature of the Commonwealth of Pennsylvania on February 22, 1855. The Morrill Act of 1862 (known as the Land Grant Act) of the Congress of the United States was accepted by the Pennsylvania Legislature in 1863 and Penn State was thereafter designated as the institution in Pennsylvania to receive the benefits of the act.

The Board of Trustees of The Pennsylvania State University is the corporate body established by the charter with complete responsibility for the government and welfare of the University and all the interests pertaining thereto including students, faculty, staff, and alumni.

Penn State's 32-member Board of Trustees is composed of the following: Five trustees serve in an ex officio capacity by virtue of their position within the University or the Commonwealth of Pennsylvania. They are the President of the University; the Governor of the Commonwealth; and the state secretaries of the departments of Agriculture; Education; and Conservation and Natural Resources. Six trustees are appointed by the Governor; nine trustees are elected by the alumni; six are elected by organized agricultural societies within the Commonwealth; and six are elected by the Board of Trustees representing business and industry endeavors. More details as to the current membership of the Board and bibliographic information are available at http://www.psu.edu/trustees/selection.html .

The Pennsylvania State University is not owned, controlled, or dominated by an alien, a foreign corporation, or foreign government.

2. As required by 10 CFR 50.33(f)(2), "the applicant shall submit estimates for total annual operating costs for each of the first five years of operations of the facility." Since the information provided in the University's 2005 submittal for a renewed license is now out of date, provide the estimated operating costs for each of the years 2009 to 2013 (the first full five-year period after the projected date of license renewal) as well as the University's sources of funding to cover the operating costs for the PSBR for the above five years.

Radiation Science and Engineering Center (RSEC) Operational Costs have remained relatively stable over the last several years at approximately $1.4 M per year. The reactor support costs are the major portion of this budget but are not separated from the Center. O&M costs are about $300,000 per year (does not include utilities or building maintenance provided by the University) and unburdened salaries and student support is approximately $1.1M. Approximately $700,000 is sourced from the College of Engineering in salary support and $700,000 from service activities. In 2007, the University provided nearly $200,000 in additional support for refurbishment and upgrade of the reactor pool coatings. Research activities provide additional monies for new equipment, support, and use.

Year	Estimated Costs*
FY 2009	$1.47M
FY 2010	$1.54M
FY 2011	$1.62M
FY 2012	$1.70M
FY 2013	$1.79M

* Assumes unburdened salary cost,
does not include utilities or RSEC building maintenance

For information on The Pennsylvania State University financial sources see the attached "Audited Financial Statements" document for Fiscal Year Ended June 30, 2007.

3. The application indicates that the cost for decommissioning the reactor was $10,540,718 in 2006 dollars. To comply with 10 CFR 50.75(d), please update the application to 2008 to include: (1) a current (2008) cost estimate for decommissioning the facility showing costs of labor, waste disposal, other items (such as energy, equipment, and supplies), a contingency factor (normally 25%), and total decommissioning costs in 2008 dollars to meet the NRC's radiological release criteria; (2) a statement of the decommissioning method to be used (e.g., DECON); and (3) a full identification of the specific means of adjusting the cost estimate (e.g., consumer price index, waste burial cost data from NUREG-1307, or labor price index) periodically over the life of the facility and a numerical example updating the 2008 cost estimate.

The decommissioning costs of any license are hard to quantify after completion and even harder to predict. For this reason the costs of previous decommissionings are taken as a basis for estimating PSU's future costs. Actual detailed costs were obtained from the Georgia Institute of Technology and estimates were obtained from the University of Virginia.

The costs for decommissioning of the Georgia Institute of Technology 5 MW reactor were

Georgia Institute of Technology 5 MW reactor Decommissioning Costs provided by Bill Miller, project manager in 2001.	
Basic Tasks	Cost
Consultant Support & Characterization	$242,100
Decommissioning Contract	$5,948,282
Executive Engineer	$728,682
ALARA Allowance	$39,171
Special Costs*	$161,718
Resident Inspector	$21,511
Total	$7,141,464

*Health Physicist Overtime, video record, relocate rad storage area.

University of Virginia Reactor Decommissioning Estimates (Included parts of other licenses) provided by Paul E. Benneche in 2003.	
Basic tasks	Cost
Outside consultant site characterization and plan preparation.	$250,000
External contract for decommissioning the facility (initial $3.5M, current estimate of $4.5M.)	$4,500,000
* Internal costs (This includes about 10 - 15 person years for overseeing UV's program and complying with reactor license requirements.) (Assuming $80,000 * 1.38 (for benefits) * 15 years = 1,656,000) * As described in a personal communication from Paul Benneche, the internal costs to UV were not well documented. However he estimated 10 - 12 person-years for UV to oversee the decommissioning. Fifteen person-years assumed.	$1,656,000
Total	$6,406,000

There was considerable discussion concerning the applicability of these Georgia Tech and University of Virginia numbers to the Penn State reactor facility. For the purposes of this plan, PSU feels that accepting the higher number will overestimate the cost, but is a prudent course of action.

The expectation of hiring an outside contractor is contrary to one of Penn State's basic assumptions for decommissioning. Penn State expects that the decontamination and decommissioning would be performed by reactor staff and tradesmen from the Office of Physical Plant with radiological services and oversite provided by Environmental Health and Safety. Special tasks for which PSU does not have the expertise will of course be contracted out. This may result in significant savings as compared to the above estimate. The actual decision as to the best personnel to use for decommissioning this facility will be made after the decision to decommission has been made. The decision will be based on the level of expertise of the available staff, the finances of the situation, and many other less quantifiable factors.

Based on Penn State's long standing policy, PSU will decontaminate the facility to the point where it will be suitable for free release with no institutional controls.

To estimate the current (2008) costs, we assume accuracy of the 2001 costs and add an annual 5% inflation adjustment to bring the current estimate to about $10M. In addition PSU adds a 25% contingency factor to bring the total current costs to about $12.6 M.

4. The application states that the University is using a self-guarantee to fund and carry out its decommissioning activities. The NRC staff recognizes that the University is using the self-guarantee for the PSBR and five *other NRC-licensed facilities. For renewal of the PSBR license, please provide the following:*

a. An updated self-guarantee, including the current (2008) decommissioning cost estimate for the PSBR and the most recent decommissioning cost estimates for the other NRC-licensed facilities covered by the self-guarantee. The updated submittal must include all the documentation listed in Section A.14.3 of NUREG-1757, Vol. 3, "Consolidated NMSS Decommissioning Guidance."

b. Documentation that the signator of the self-guarantee, if not the Chief Executive Officer or Chief Financial Officer (e.g., corporate controller), has the authority to bind the University in the self-guarantee.

c. If the updated self-guarantee agreement will be in the same format used in the applicant's July 12, 2007 self-guarantee agreement, make the following revisions to the 2007 format:

(1) Delete the word "beneficiary" in the first paragraph and in Recital 13.

(2) To comply with Section II.B(3) of Appendix C to 10 CFR 30 in Recital 8, change the time period that the guarantor agrees to submit financial statements and financial test data annually from 180 days to 90 days of the close of the University's fiscal year.

(3) Delete Recital 10 as these requirements for transfer of ownership of the licensed activity are already covered under 10 CFR 50.80, 30.34(b), and 70.32(a)(3), which requires prior NRC approval.

In early 2008, the Commonwealth of Pennsylvania was awarded Agreement State Status. For this reason, PSU now has only two NRC regulated license. PSU is will of course provide the necessary funds for decommissioning these licenses. The current estimates for decontamination and decommissioning are shown below. The two letters that supply the required certifications and recitals are attached.

License # and Docket #	License Description	Estimate based on year 2001 dollars	Certified Amounts or Current Cost Estimates
R-2 050-0005	Research Reactor	$7,141,464	$10,048,757
SNM-95 70-113	Special Nuclear Material	$15,000	$21,106
	Sub total		$10,069,864
	25% contingency fund		$2,517,466
	Total Estimated Costs:		$12,587,329

Penn State's 2008 final financial statements are not available within 90 days of the close of the University's fiscal year. This is because of the length of time necessary for auditing the finances of this large and complex institution. The audited financial statement for Fiscal Year 2007 is attached.

References:

1. TRD 070.01006.05 "Pulsing Temperature Limit for TRIGA LEU Fuel"
2. DOE-HDBK-1012/2-92 "DOE Fundamentals Handbook, Thermodynamics, Heat Transfer, and Fluid Flow", Volume 2 of 3
3. Levine, S. "Temperature Behavior of 12w/o U TRIGA Fuel"
4. GA-6216 "Characteristics of Large Reactivity Insertions in a High Performance TRIGA U-ZrH Core" -1965
5. Levine, Geisler and Totenbier, "Temperature behavior of 12w/o Uranium TRIGA Fuel"
6. Foderero, A. "Photon Shielding Manual" (1976)
7. El-Wakil "Nuclear Heat Transport" ANS 1978
8. TRD 070.01006.04 "TRIGA Reactor Thermal-Hydraulic Study"
9. Feldman, E.E. "Fundamental Approach to TRIGA Steady-State Thermal-Hydraulic CHF Analysis" (Argonne National Laboratory-2007).
10. Haag, J. A., and Levine, S. H., "Thermal Analysis of The Pennsylvania State University Breazeale Nuclear Reactor," Nucl. Technology, vol. 19, p.6 (July 1973).

PENNSTATE

Joseph J. Doncsecz
Corporate Controller

The Pennsylvania State University
408 Old Main
University Park, PA 16802-1505

814-865-1355
Fax: 814-863-0701

October 29, 2008

William Kennedy
Research and Test Reactors Branch A
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

License numbers:
R-2 The Pennsylvania State University, University Park, PA
SNM-95 The Pennsylvania State University, University Park, PA

I am the Corporate Controller of the Pennsylvania State University (the "University") located at 408 Old Main, University Park, PA 16802, a non-profit University. This letter is in support of the University's use of the self-guarantee financial test to demonstrate financial assurance, as specified in 10 CFR Part 50. The University has no parent company.

The University guarantees, through the self-guarantee submitted to demonstrate compliance under 10 CFR Part 50 and 70 the decommissioning of the facilities and licenses listed below that are owned or operated by the University. The current cost estimates or certified amounts for decommissioning, so guaranteed, are shown for each facility:

License # and Docket #	**License Description**	Estimate based on year 2001 dollars	**Certified Amounts or Current Cost Estimates** (5% per year increase)
R-2 050-0005	Research Reactor	$7,141,464	$10,048,757
SNM-95 70-113	Special Nuclear Material	$15,000	$21,106
		Sub total	$10,069,863
	25% contingency fund		$2,517,466
	Total Estimated Costs:		$12,587,329

I hereby certify that the University is currently a going concern, and that it possesses positive tangible net worth in the amount of $4,404,363,000.

This fiscal year of the University ends on June 30. A copy of the University's most recent financial statement is enclosed.

The University is not required to file a Form 10–K with the U.S. Securities and Exchange Commission.

The University satisfies the following self-guarantee test from 10 CFR 30 Appendix E:

- The current bond rating of most recent uninsured, uncollateralized, and unencumbered issuance of this institution is AA.
- Name of rating service: Standard & Poor's
- Date of issuance of bond: April 10, 2008
- Date of maturity of bond: August 15, 2029

I hereby certify that the content of this letter is true and correct to the best of my knowledge.

Sincerely,

Joseph J. Doncsecz
Corporate Controller

Copy to: Eric Boeldt, Radiation Safety Officer, University Park
Kenan Unlu, Director, Radiation Science and Engineering Center

Enclosures: Self-Guarantee Agreement
Audited Financial Statement

The Pennsylvania State University

Financial Assurance for Cost of Decommissioning Activities

Self-Guarantee Agreement

Guarantee made by The Pennsylvania State University, a nonprofit University, organized under the laws of the Commonwealth of Pennsylvania, herein referred to as "guarantor," to the U. S. Nuclear Regulatory Commission, on behalf of the University as licensee.

Recitals

1. The guarantor has full authority and capacity to enter into this self-guarantee by the bylaws of the Trustees of the Pennsylvania State University.

2. This self-guarantee is being issued to comply with regulations issued by NRC, an agency of the U. S. Government, pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974. NRC has promulgated regulations in Title 10, Chapter I of the *Code of Federal Regulations,* Parts 50 and 70, which require that a holder of, or an applicant for, a materials license issued pursuant to 10 CFR Parts 50 and 70 provide assurance that funds will be available when needed for required decommissioning activities.

3. The self-guarantee is issued to provide financial assurance for decommissioning activities for the licenses and facilities shown.

License # and Docket #	**License Description**	Estimate based on year 2001 dollars	**Certified Amounts or Current Cost Estimates** (5% per year increase)
R-2 050-0005	Research Reactor	$7,141,464	$10,048,757
SNM-95 70-113	Special Nuclear Material	$15,000	$21,106
		Sub total	$10,069,863
	25% contingency fund		$2,517,466
	Total Estimated Costs:		$12,587,329

4. The guarantor meets or exceeds the following financial test criteria for a nonprofit University that issues bonds. Specifically, the current rating for our most recent uninsured, uncollateralized, and unencumbered bond issuance was AA as issued by Standard & Poor's, and agrees to comply with all notification requirements as specified in 10 CFR Part 50, 70, and Appendix A to 10 CFR Part 30

5. The guarantor does not have a parent company holding majority control of its voting stock.

6. Decommissioning activities as used below refer to the activities required by 10 CFR Part 50 and 70 for decommissioning of the facilities identified above.

7. Pursuant to the guarantor's authority to enter into this guarantee, the guarantor guarantees to the NRC that the guarantor shall:

   (a) carry out the required decommissioning activities, as required by the licenses listed above.

8. The guarantor agrees to submit revised financial statements, financial test data annually within 180 days of the close of its fiscal year.

9. The guarantor agrees that if, at the end of any fiscal year before termination of this self-guarantee, it fails to meet the self-guarantee financial test criteria, it shall send within 90 days of the end of the fiscal year, by certified mail, notice to the NRC that it intends to provide alternative financial assurance as specified in 10 CFR Part 30. Within 120 days after the end of the fiscal year, the guarantor shall establish such financial assurance.

10. *{deleted}*

11. The guarantor agrees that if it determines, at any time other than as described in Recital 9, that it no longer meets the self-guarantee financial test criteria or it is disallowed from continuing as a self-guarantor, it shall establish alternative financial assurance as specified in 10 CFR Parts 50 and 70 within 30 days.

12. The guarantor, as well as its successors and assigns and agrees to remain bound jointly and severally under this guarantee notwithstanding any or all of the following: amendment or modification of the license or NRC-approved decommissioning funding plan for that facility, the extension or reduction of the time of performance of required activities, or any other modification or alteration of an obligation of the licensee pursuant to 10 CFR Parts 50 and 70.

13. The guarantor agrees that it shall be liable for all litigation costs incurred by the NRC in any successful effort to enforce the agreement against the guarantor.

14. The guarantor agrees to remain bound under this self-guarantee for as long as it, as licensee, must comply with the applicable financial assurance requirements of 10 CFR Part 50 and 70, for the previously listed facilities, except that the guarantor may cancel this self-guarantee by sending notice by certified mail to the NRC, such cancellation to become effective not before an alternative financial assurance mechanism has been put in place by the guarantor

15. The guarantor agrees that if it, as licensee, fails to provide alternative financial assurance as specified in 10 CFR Parts 50 and 70 and obtain written approval of such assurance from the NRC within 90 days after a notice of cancellation by the

guarantor is received by the NRC from the guarantor, the guarantor shall make full payment under the self-guarantee.

16. The guarantor expressly waives notice of acceptance of this self-guarantee by the NRC. The guarantor also expressly waives notice of amendments or modifications of the decommissioning requirements.

17. If the guarantor files financial reports with the U.S. Securities and Exchange Commission, then it shall promptly submit them to its independent auditor and to NRC during each year in which this self guarantee is in effect.

18. The guarantor agrees that if, at any time before termination of this self-guarantee, its most recent bond issuance ceases to be rated in the category of "A" or above by either Standard & Poor's or Moody's, it shall provide notice in writing of such fact to NRC within 20 days after publication of the change by the rating service.

I hereby certify that this self-guarantee is true and correct to the best of my knowledge.

Effective date: OCT 29 2008

Pennsylvania State University:

Joseph J. Doncsecz
Corporate Controller

PENNSTATE

1855

Audited Financial Statements

The Pennsylvania State University
Fiscal Year Ended June 30, 2007

THE PENNSYLVANIA STATE UNIVERSITY

UNIVERSITY OFFICERS

as of September 28, 2007

GRAHAM B. SPANIER
President of the University

RODNEY A. ERICKSON
Executive Vice President and
Provost of the University

RODNEY P. KIRSCH
Senior Vice President for Development
and Alumni Relations

HAROLD L. PAZ
Chief Executive Officer, The Milton S.
Hershey Medical Center, and Senior
Vice President for Health Affairs, and
Dean of the College of Medicine

EVA J. PELL
Senior Vice President for Research and
Dean of the Graduate School

GARY C. SCHULTZ
Senior Vice President for
Finance and Business/Treasurer

THE PENNSYLVANIA STATE UNIVERSITY

VIRTUE LIBERTY AND INDEPENDENCE

1855

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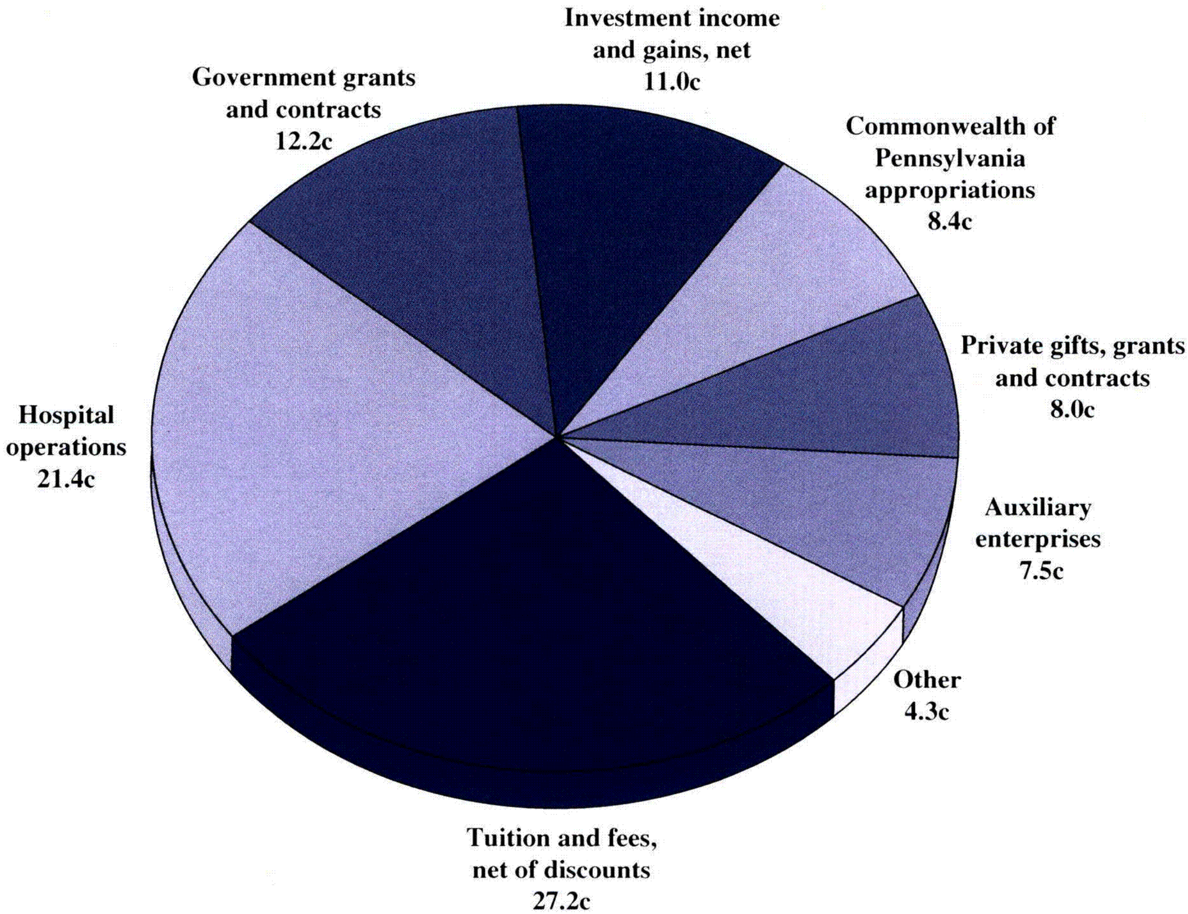
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Commonwealth of
Pennsylvania
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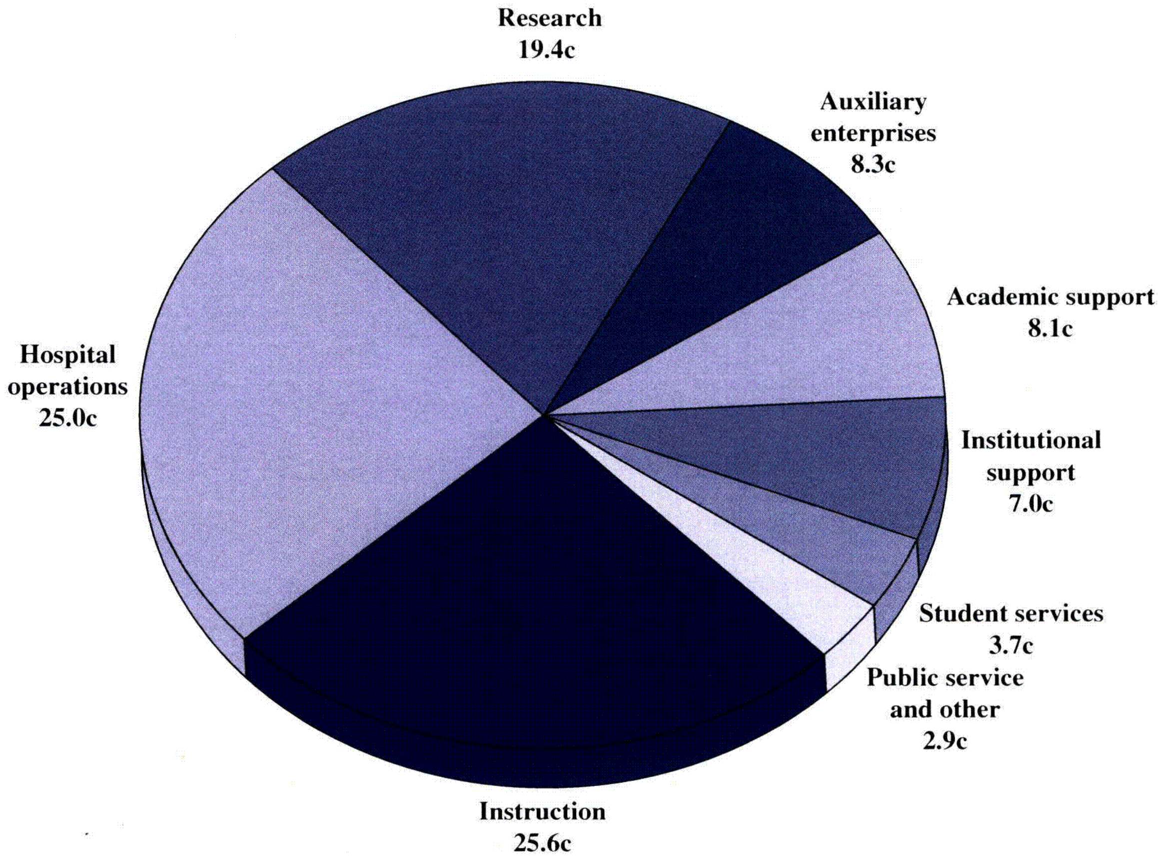
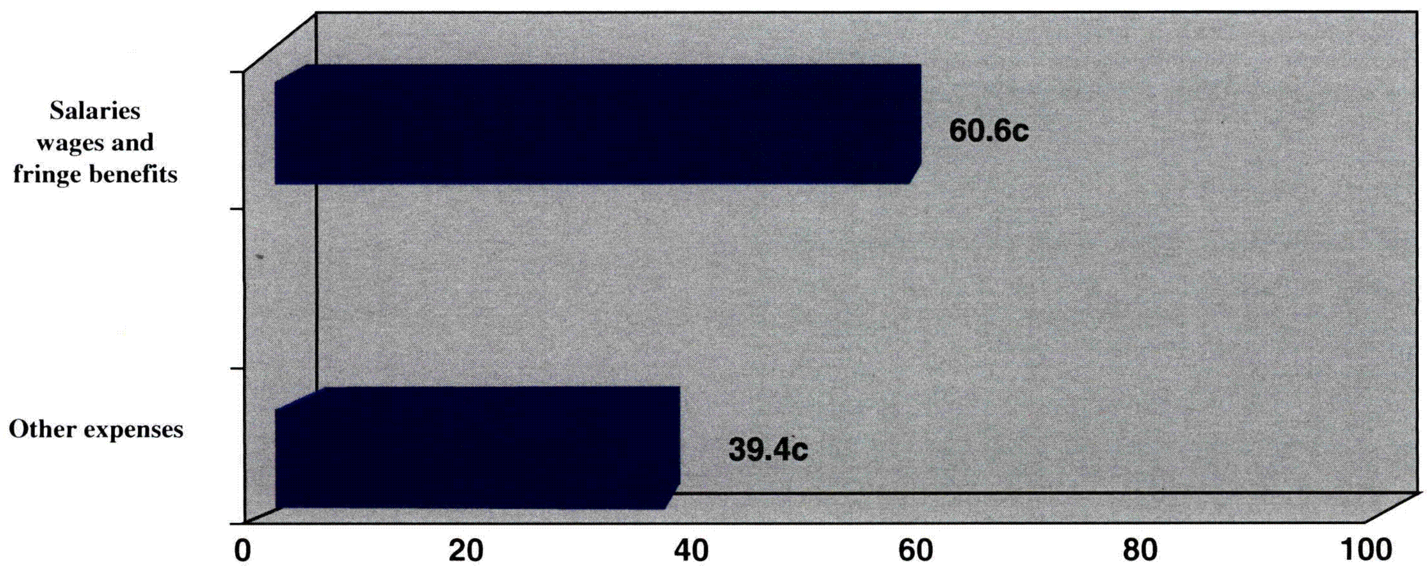
Auxiliary
enterprises
7.5c
Other
4.3c
Tuition and fees,
net of discounts
27.2c

USES



APPLICATION BY OBJECT



PENNSTATE

Joseph J. Doncsecz
Corporate Controller

The Pennsylvania State University
408 Old Main
University Park, PA 16802-1505

814-865-1355
Fax: 814-863-0701

September 28, 2007

Dr. Graham Spanier, President
The Pennsylvania State University

Dear Dr. Spanier:

The audited consolidated financial statements of The Pennsylvania State University and subsidiaries (the "University") for the fiscal year ended June 30, 2007 are presented on the accompanying pages. These financial statements represent a complete and permanent record of the finances of the University for the year.

These financial statements have been examined by Deloitte & Touche LLP, Certified Public Accountants of Philadelphia, Pennsylvania, and their report has been made a part of this record.

Respectfully submitted,

Joseph J. Doncsecz
Corporate Controller

Albert G. Horvath
Vice President for Finance & Business

Gary C. Schultz
Senior Vice President for Finance & Business/Treasurer

An Equal Opportunity University

Deloitte.

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INDEPENDENT AUDITORS' REPORT

To the Board of Trustees of The Pennsylvania State University
University Park, PA

We have audited the accompanying consolidated statements of financial position of The Pennsylvania State University and subsidiaries (the "University") as of June 30, 2007 and 2006, and the related consolidated statements of activities and cash flows for the years then ended. These financial statements are the responsibility of the management of the University. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but are not for the purpose of expressing an opinion on the effectiveness of the University's internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

As discussed in Note 9 to the consolidated financial statements, during the year ended June 30, 2007, the University adopted Statement of Financial Accounting Standard ("SFAS") No. 158, "Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans". As discussed in Note 2, during the year ended June 30, 2006, the University adopted Financial Accounting Standards Board Interpretation ("FIN") No. 47, "Accounting for Conditional Asset Retirement Obligations".

In our opinion, such consolidated financial statements present fairly, in all material respects, the financial position of the University as of June 30, 2007 and 2006, and the changes in its net assets and its cash flows for the years then ended in conformity with accounting principles generally accepted in the United States of America.

Deloitte & Touche LLP

September 28, 2007

Member of
Deloitte Touche Tohmatsu

THE PENNSYLVANIA STATE UNIVERSITY
CONSOLIDATED STATEMENTS OF FINANCIAL POSITION
ASSETS
JUNE 30, 2007 AND 2006
(in thousands)

	June 30, 2007	June 30, 2006
Current assets:		
Cash and cash equivalents - in short-term operating portfolios	$ 622,875	$ 428,798
Cash and cash equivalents - in operating investment portfolios	59,978	36,719
Deposits	21,104	18,121
Accounts receivable, net of allowances of $24,139 and $19,599	333,058	305,601
Contributions receivable, net	42,456	37,774
Loans to students, net of allowances of $4,886 and $5,008	11,305	11,075
Inventories	27,916	27,093
Prepaid expenses and other assets	48,857	44,609
Investments held under securities lending program	309,682	220,032
Total current assets	1,477,231	1,129,822
Noncurrent assets:		
Deposits held by bond trustees	18,268	18,625
Contributions receivable, net	91,863	72,666
Loans to students, net of allowances of $12,564 and $12,262	28,793	27,111
Deferred bond costs	5,106	5,606
Total investment in plant, net	2,552,935	2,426,556
Beneficial interest in perpetual trusts	17,078	15,676
Investments	3,066,165	2,606,418
Total noncurrent assets	5,780,208	5,172,658
Total assets	$ 7,257,439	$ 6,302,480

See notes to consolidated financial statements.

THE PENNSYLVANIA STATE UNIVERSITY
CONSOLIDATED STATEMENTS OF FINANCIAL POSITION
LIABILITIES AND NET ASSETS
JUNE 30, 2007 AND 2006
(in thousands)

	June 30, 2007	June 30, 2006
Current liabilities:		
Accounts payable and other accrued expenses	$ 348,112	$ 347,576
Deferred revenue	193,148	165,293
Long-term debt	50,937	47,590
Present value of annuities payable	5,282	4,691
Accrued postretirement benefits	28,944	28,036
Liability under securities lending program	309,682	220,032
Total current liabilities	936,105	813,218
Noncurrent liabilities:		
Deposits held in custody for others	34,088	31,864
Deferred revenue	22,396	841
Long-term debt	860,569	773,610
Present value of annuities payable	36,907	32,106
Accrued postretirement benefits	805,618	658,909
Refundable United States Government student loans	32,894	33,104
Other liabilities	124,499	117,482
Total noncurrent liabilities	1,916,971	1,647,916
Total liabilities	2,853,076	2,461,134
Net assets:		
Unrestricted -		
Undesignated	950	938
Designated for specific purposes	1,453,003	1,215,547
Net investment in plant	1,524,097	1,463,639
Total unrestricted	2,978,050	2,680,124
Temporarily restricted	587,469	400,361
Permanently restricted	838,844	760,861
Total net assets	4,404,363	3,841,346
Total liabilities and net assets	$ 7,257,439	$ 6,302,480

See notes to consolidated financial statements.

THE PENNSYLVANIA STATE UNIVERSITY
CONSOLIDATED STATEMENT OF ACTIVITIES
FOR THE YEAR ENDED JUNE 30, 2007
(in thousands)

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Revenues and other support:				
Tuition and fees, net of discounts of $91,906	$ 1,057,691	$ -	$ -	$ 1,057,691
Commonwealth of Pennsylvania -				
Appropriations	327,715	-	-	327,715
Special contracts	108,448	-	-	108,448
Department of General Services projects	7,688	-	-	7,688
United States Government grants and contracts	360,026	-	-	360,026
Private gifts, grants and contracts	197,160	38,455	75,218	310,833
Endowment income, net	116,526	163,911	10,472	290,909
Other investment income, net	127,615	11,416	153	139,184
Sales and services of educational activities	40,599	-	-	40,599
Recovery of indirect costs	109,634	-	-	109,634
Auxiliary enterprises	291,773	-	-	291,773
Hospital operations	832,328	-	-	832,328
Other sources	16,339	1,091	1,412	18,842
Net assets released from restrictions	26,394	(26,394)	-	-
Total revenues and other support	3,619,936	188,479	87,255	3,895,670
Expenses and losses:				
Educational and general -				
Instruction	826,097	-	-	826,097
Research	625,519	-	-	625,519
Public service	79,035	-	-	79,035
Academic support	261,816	-	-	261,816
Student services	121,785	-	-	121,785
Institutional support	225,420	-	-	225,420
Total educational and general	2,139,672	-	-	2,139,672
Auxiliary enterprises	267,671	-	-	267,671
Hospital operations	806,062	-	-	806,062
Write-offs and disposals of assets	5,004	-	-	5,004
Actuarial adjustment on annuities payable	-	1,371	9,272	10,643
Total expenses and losses	3,218,409	1,371	9,272	3,229,052
Increase in net assets before cumulative effect	401,527	187,108	77,983	666,618
Cumulative effect of adoption of new accounting principle	(103,601)	-	-	(103,601)
Increase in net assets	297,926	187,108	77,983	563,017
Net assets at the beginning of the year	2,680,124	400,361	760,861	3,841,346
Net assets at the end of the year	$ 2,978,050	$ 587,469	$ 838,844	$ 4,404,363

See notes to consolidated financial statements.

THE PENNSYLVANIA STATE UNIVERSITY
CONSOLIDATED STATEMENT OF ACTIVITIES
FOR THE YEAR ENDED JUNE 30, 2006
(in thousands)

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Revenues and other support:				
Tuition and fees, net of discounts of $87,784	$ 949,774	$ -	$ -	$ 949,774
Commonwealth of Pennsylvania -				
Appropriations	312,026	-	-	312,026
Special contracts	102,279	-	-	102,279
Department of General Services projects	43,776	-	-	43,776
United States Government grants and contracts	355,396	-	-	355,396
Private gifts, grants and contracts	187,748	26,942	41,307	255,997
Endowment income, net	75,178	64,751	10,158	150,087
Other investment income, net	45,626	4,592	197	50,415
Sales and services of educational activities	40,427	-	-	40,427
Recovery of indirect costs	106,975	-	-	106,975
Auxiliary enterprises	272,703	-	-	272,703
Hospital operations	753,704	-	-	753,704
Other sources	18,280	365	276	18,921
Net assets released from restrictions	23,628	(23,628)	-	-
Total revenues and other support	3,287,520	73,022	51,938	3,412,480
Expenses and losses:				
Educational and general -				
Instruction	807,442	-	-	807,442
Research	616,707	-	-	616,707
Public service	74,148	-	-	74,148
Academic support	266,168	-	-	266,168
Student services	113,785	-	-	113,785
Institutional support	229,027	-	-	229,027
Total educational and general	2,107,277	-	-	2,107,277
Auxiliary enterprises	254,698	-	-	254,698
Hospital operations	719,097	-	-	719,097
Write-offs and disposals of assets	4,563	-	-	4,563
Actuarial adjustment on annuities payable	-	1,728	4,748	6,476
Total expenses and losses	3,085,635	1,728	4,748	3,092,111
Increase in net assets before cumulative effect	201,885	71,294	47,190	320,369
Cumulative effect of adoption of new accounting principle	(44,372)	-	-	(44,372)
Increase in net assets	157,513	71,294	47,190	275,997
Net assets at the beginning of the year	2,522,611	329,067	713,671	3,565,349
Net assets at the end of the year	$ 2,680,124	$ 400,361	$ 760,861	$ 3,841,346

See notes to consolidated financial statements.

THE PENNSYLVANIA STATE UNIVERSITY
CONSOLIDATED STATEMENTS OF CASH FLOWS
FOR THE YEARS ENDED JUNE 30, 2007 AND 2006
(in thousands)

	June 30, 2007	June 30, 2006
Cash flows from operating activities:		
Increase in net assets	$ 563,017	$ 275,997
Adjustments to reconcile change in net assets to net cash provided by operating activities -		
Actuarial adjustment on annuities payable	10,644	6,476
Contributions restricted for long-term investment	(91,184)	(72,616)
Interest and dividends restricted for long-term investment	(20,955)	(17,177)
Net realized and unrealized gains on long-term investments	(270,579)	(99,805)
Depreciation and amortization expense	169,762	168,340
Write-offs and disposals of assets	5,330	5,227
Contributions of land, buildings and equipment	(2,625)	(9,323)
Buildings and equipment provided by Pennsylvania Department of General Services	(1,785)	(14,027)
Contribution to government student loan funds	254	254
Provision for bad debts	23,871	15,310
Cumulative effect of adoption of new accounting principle	103,601	44,372
Increase in deposits	(2,984)	(1,713)
Increase in receivables	(69,063)	(31,688)
Increase in inventories	(824)	(9,123)
Increase in prepaid expenses and other assets	(5,428)	(11,644)
Increase in accounts payable and other accrued expenses	7,904	4,044
Increase in deferred revenue	49,410	15,500
Increase in accrued postretirement benefits	44,015	70,507
Net cash provided by operating activities	512,381	338,911
Cash flows from investing activities:		
Purchase of land, buildings and equipment	(254,048)	(285,405)
Decrease in deposits held by bond trustees	357	209
Advances on student loans	(13,465)	(14,177)
Collections on student loans	10,346	11,434
(Increase)/decrease in investments held under securities lending program	(89,650)	12,524
Increase/(decrease) in liability under securities lending program	89,650	(12,524)
Purchase of investments	(2,399,093)	(2,771,709)
Proceeds from sale of investments	2,195,405	2,639,922
Net cash used by investing activities	(460,498)	(419,726)
Cash flows from financing activities:		
Contributions restricted for long-term investment	91,184	72,616
Interest and dividends restricted for long-term investment	20,955	17,177
Payments of annuity obligations	(5,327)	(4,732)
Proceeds from issuance of bonds	179,464	4,820
Principal payments on notes, bonds and capital leases	(121,303)	(33,411)
Proceeds related to government student loan funds, net of collection costs	480	584
Net cash provided by financing activities	165,453	57,054
Net increase/(decrease) in cash and cash equivalents	217,336	(23,761)
Cash and cash equivalents at the beginning of the year	465,517	489,278
Cash and cash equivalents at the end of the year	$ 682,853	$ 465,517

See notes to consolidated financial statements.

1. THE UNIVERSITY AND RELATED ENTITIES

The Pennsylvania State University ("the University"), which was created as an instrumentality of the Commonwealth of Pennsylvania, is organized as a non-profit corporation under the laws of the Commonwealth. As Pennsylvania's land grant university, the University is committed to improving the lives of the people of Pennsylvania, the nation and the world through its integrated, tri-part mission of high-quality teaching, research and outreach.

The financial statements of the University include, on a consolidated basis, the financial statements of The Milton S. Hershey Medical Center ("TMSHMC"), a not-for-profit corporation, (see Note 10 for additional information about TMSHMC) and The Corporation for Penn State and its subsidiaries ("the Corporation"). The Corporation is a non-profit member corporation organized in 1985 for the exclusive purpose of benefiting and promoting the interests of the University, the Corporation's sole member. The Corporation's assets and revenues consist primarily of the assets and revenues of The Pennsylvania College of Technology ("Penn College"), a wholly-owned subsidiary of the Corporation. All material transactions between the University, TMSHMC and the Corporation have been eliminated.

2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The significant accounting policies followed by the University, as summarized below, are in accordance with the recommendations for accounting and reporting included in the Audit and Accounting Guide for Not-for-Profit Organizations issued by the American Institute of Certified Public Accountants.

Basis of Presentation

The University's financial statements include statements of financial position, statements of activities and statements of cash flows. Net assets and the changes in net assets are classified as permanently restricted, temporarily restricted or unrestricted.

Permanently restricted net assets consist primarily of the historical amounts of endowed gifts. Additionally, contributions receivable and remainder interests, which are required by donors to be permanently retained, are included at their estimated present values.

Temporarily restricted net assets consist primarily of contributions receivable and accumulated endowment gains which can be expended, but for which restrictions have not yet been met. Such restrictions include time restrictions imposed by donors or implied by the nature of the gift or by interpretations of law.

Unrestricted net assets are all the remaining net assets of the University.

As permitted, donor-restricted gifts that are received and either spent or deemed spent within the same year are reported as unrestricted revenue. Gifts of long-lived assets are reported as unrestricted revenue. Gifts specified for the acquisition or construction of long-lived assets are reported as unrestricted net assets when the assets are placed in service.

The University maintains various funds and accounts, including endowments, funds functioning as endowments, departmental funds and related accumulated gains, in accordance with the principles of "fund accounting." This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds that are in accordance with specified activities or objectives. Separate accounts are maintained for each fund. Gifts are recorded in funds and investment income is distributed to funds throughout the year. Income distributed to funds may be a combination of capital appreciation and earnings pursuant to the University's total return investment policy.

Basis of Accounting

The financial statements of the University have been prepared on the accrual basis of accounting.

Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts on the financial statements and the disclosure of contingencies and commitments. Actual results could differ from those estimates.

Revenue Recognition

Tuition revenue is recognized in the fiscal year in which the substantial portion of the educational term occurs. Revenues for auxiliary enterprises are recognized as the related goods and services are delivered and rendered. Grant revenues are recognized as the eligible grant activities are conducted. Payments received in advance for tuition, goods and services are deferred.

Unconditional contributions receivable are recognized when received and consist of written or oral promises to contribute to the University in the future. Contributions receivable are recorded with the revenue assigned to the appropriate category of restriction. Contributions receivable are recorded after discounting to the present value of the future cash flows.

TMSHMC has agreements with third-party payors that provide for payments to TMSHMC at amounts different from its established rates. Payment arrangements include prospectively determined rates per discharge, reimbursed costs, discounted charges and per diem payments. Net patient service revenue is reported at the estimated net realizable amounts from patients, third-party payors and others for services rendered, including estimated retroactive adjustments under reimbursement agreements with third-party payors. Retroactive adjustments are accrued on an estimated basis in the period the related services are rendered and adjusted in future periods as final settlements are determined or such estimates change.

TMSHMC has agreements with various Health Maintenance Organizations ("HMO's") to provide medical services to subscribing participants. Under these agreements, TMSHMC receives monthly capitation payments based on the number of each HMO's participants, regardless of services actually performed by TMSHMC. In addition, the HMO's make fee-for-service payments to TMHSMC for certain covered services based upon discounted fee schedules.

TMSHMC provides care to patients who meet certain criteria under its charity care policy without charge or at amounts less than its established rates.

Fair Value of Financial Instruments

The University has provided fair value estimates for certain financial instruments in the notes to the financial statements. Fair value information presented in the financial statements is based on information available at June 30, 2007 and 2006. The carrying amounts of cash and cash equivalents, accounts receivable and accounts payable are reasonable estimates of their fair value. The carrying values of the amounts of the University's loans to students are also reasonable estimates of their fair value, because approximately 99% of the total outstanding loans to students as of June 30, 2007 and 2006 have been made at the rates available to students for similar loans at such times. The fair value of investments is disclosed in Note 3. The fair value of the University's bonds payable is disclosed in Note 6.

Cash Flows

The following items are included as supplemental disclosure to the statements of cash flows for the years ended June 30:

	2007	2006
Interest paid	$ 33,932,000	$ 34,326,000
Non-cash acquisitions of land, buildings and equipment	3,969,000	19,997,000
Non-cash construction costs/deferred lease obligation at TMSHMC	31,324,000	-

The University defines cash and cash equivalents based on the primary purpose of the investment portfolio that holds the investment. Due to the investment strategies of portfolio managers, there is $59,978,000 and $36,719,000 of cash and cash equivalents held in operating investment portfolios at June 30, 2007 and 2006, respectively. These assets have been separately identified as cash and cash equivalents in the statements of financial position.

Inventories

Inventories are stated at cost, generally on the first-in, first-out basis, which is lower than market.

Investments

The University's investments are reported at fair market value in the accompanying financial statements. Investments in equity securities with readily determinable fair values and all investments in debt securities are reported at fair values with gains and losses included in the consolidated statements of activities. The University records derivative securities at market value with changes in market value reflected in the consolidated statements of activities.

The estimated fair value amounts for marketable debt and equity securities held by the University have been reviewed by the University and determined using available market information as supplied by the various financial institutions that act as trustees or custodians for the University. For non-liquid holdings, generally investments in real estate, venture capital and energy limited partnerships, estimated fair value is determined based upon financial information provided by the limited partnerships. This financial information includes assumptions and methods that were reviewed by University management. The University believes that the estimated fair value is a reasonable estimate of market value as of June 30, 2007 and 2006. Because the limited partnerships are not readily marketable, the estimated value is subject to uncertainty and, therefore, may differ from the value that would have been used had a ready market existed, and such differences could be material.

Beneficial Interest in Perpetual Trusts

The University receives endowment income from investments of $17,078,000 and $15,676,000 held by outside trustees at June 30, 2007 and 2006, respectively. The present value of expected future cash flows to the University from such investments has been recorded as permanently restricted net assets and related beneficial interest in perpetual trusts in the financial statements.

Investment in Plant

Fixed assets, including collections, are stated at cost or fair market value at date of gift. Depreciation is computed over the estimated economic lives of the assets using the straight-line method. Total investment in plant as of June 30 is comprised of the following:

	2007	2006
Land	$ 90,930,000	$ 87,447,000
Buildings	3,197,891,000	2,986,479,000
Improvements other than buildings	422,692,000	398,502,000
Equipment	805,238,000	782,585,000
Total plant	4,516,751,000	4,255,013,000
Less accumulated depreciation	(1,963,816,000)	(1,828,457,000)
Total investment in plant, net	$ 2,552,935,000	$ 2,426,556,000

Asset Retirement Obligation

Effective June 30, 2006, the University adopted Financial Accounting Standards Board ("FASB") Interpretation No. 47, *Accounting for Conditional Asset Retirement Obligations* ("FIN 47"). FIN 47 provides an interpretation of Statement of Financial Accounting Standard ("SFAS") No. 143, *Accounting for Retirement Obligations*, by clarifying that conditional asset retirement obligations meet the definition of a liability even though uncertainty may exist about the timing or method of settlement. Under the provisions of FIN 47, the University is obligated to record a liability for conditional asset retirement obligations. The University performed an analysis of such obligations and determined that asbestos abatement costs represented the University's primary source of such liabilities. The University reviewed all facilities and determined the timing, method and cost of asbestos abatement using a variety of assumptions and estimates. As a result of this process, at June 30, 2006, the University recorded the cumulative effect of conditional asset retirement obligations totaling $44,372,000. The carrying value of the liability at June 30, 2007 is $44,248,000, which includes accretion expense of $2,096,000.

Accounting Pronouncements

In June 2006, the FASB issued Interpretation No. 48, *Accounting for Uncertainty in Income Taxes* – an Interpretation of FASB Statement No. 109 ("FIN 48"). This interpretation establishes the accounting for uncertain tax positions, including recognition and measurement of their financial statement effects. The interpretation will be effective for the University in 2008. University management is currently evaluating the impact of FIN 48, which is not expected to be material.

Reclassifications

Certain 2006 amounts have been reclassified to conform with 2007 presentation of Commonwealth of Pennsylvania–special contracts and United States government grants and contracts within the consolidated statement of activities.

3. INVESTMENTS

Investments by major category as of June 30 are summarized as follows:

	2007	2006
Money markets	$ 286,910,000	$ 243,016,000
Fixed income:		
U.S. government/agency	392,430,000	482,256,000
U.S. corporate	278,725,000	312,048,000
Foreign	66,704,000	59,013,000
Other	617,334,000	319,499,000
Equities	1,002,935,000	836,011,000
Private partnerships	481,105,000	391,294,000
Investments held under securities lending program	309,682,000	220,032,000
Total	$3,435,825,000	$2,863,169,000

Other fixed income investments consist of collateralized mortgage obligations, mortgage-backed securities, asset-backed securities and municipal bonds. Equity investments are comprised of domestic and foreign common stocks. Private partnerships consist primarily of interests in real estate, private equity, venture capital, energy and hedge fund limited partnerships.

The following schedule summarizes the investment return and its classification in the consolidated statement of activities for the year ended June 30, 2007:

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Dividends and interest	$ 130,700,000	$ 4,243,000	$ 10,625,000	$ 145,568,000
Net realized gains, including endowment spending	38,690,000	53,757,000	-	92,447,000
Net unrealized gains	74,751,000	117,327,000	-	192,078,000
Total returns	$ 244,141,000	$ 175,327,000	$ 10,625,000	$ 430,093,000

The following schedule summarizes the investment return and its classification in the consolidated statement of activities for the year ended June 30, 2006:

	Unrestricted	Temporarily Restricted	Permanently Restricted	Total
Dividends and interest	$ 84,869,000	$ 3,376,000	$ 9,756,000	$ 98,001,000
Net realized gains, including endowment spending	45,549,000	27,618,000	599,000	73,766,000
Net unrealized gains/(losses)	(9,614,000)	38,349,000	-	28,735,000
Total returns	$ 120,804,000	$ 69,343,000	$ 10,355,000	$ 200,502,000

In the management of investments, the University authorizes certain of its investment managers to purchase derivative securities to attain a desired market position; and the University may directly invest in derivative securities to attain a desired market position. The University does not trade or issue derivative financial instruments other than through the investment management practices noted above. Gains and losses from derivative instruments are reported in the consolidated statements of activities. Futures contracts, which are fully cash collateralized, are marked to market daily and are included in the carrying value of the University's investments. The market value of all derivative instruments is included in the market value of the University's investments. Futures contracts have minimal credit risk because the counterparties are the exchanges themselves. The University directly held no derivative securities at June 30, 2007. Fully cash collateralized derivative securities comprised approximately 3.0% of total investments at June 30, 2006.

Through an agreement with its primary investment custodian, the University participates in lending securities to brokers. Collateral is generally limited to cash, government securities, and irrevocable letters of credit. Both the investment custodian and the security borrowers have the right to terminate a specific loan of securities at any time. The University receives lending fees and continues to earn interest and dividends on the loaned securities. At June 30, 2007 and 2006, the University held $309,682,000 and $220,032,000, respectively, of cash and cash equivalents as collateral deposits for the securities lending program. The collateral is included as an asset and the obligation to return such collateral is presented as a liability in the consolidated statements of financial position. The securities on loan had an estimated fair value of $303,370,000 and $216,174,000 at June 30, 2007 and 2006, respectively.

4. POOLED ASSETS

The University uses a "total return" approach to endowment fund investment management. This approach emphasizes total investment return (current income plus or minus realized and unrealized capital gains and losses) as the basis for endowment spending. The University has implemented an endowment income spending policy whereby a predetermined amount is paid out each fiscal year based upon a prescribed formula in accordance with Pennsylvania statutes.

Investments aggregating $1,587,197,000 and $1,303,476,000 at June 30, 2007 and 2006, respectively, for certain endowment funds and funds functioning as endowments are pooled on a market value basis, with each individual fund subscribing to or disposing of units on the basis of the market value per unit at the beginning of the month when the transaction takes place.

The following schedule summarizes certain information about pooled assets on a per unit basis as of June 30:

	2007	2006
Market value per unit	$ 32.57	$ 28.28
Annual net gains per unit	$ 4.29	$ 2.21
Average annual earnings per unit, exclusive of gains	$ 1.42	$ 0.85

5. CONTRIBUTIONS RECEIVABLE

Contributions receivable are summarized as follows as of June 30:

	2007	2006
In one year or less	$ 52,568,000	$ 45,258,000
Between one year and five years	64,024,000	47,666,000
More than five years	76,511,000	70,397,000
	193,103,000	163,321,000
Less allowance	(9,459,000)	(7,196,000)
Less discount	(49,325,000)	(45,685,000)
Contributions receivable, net	$ 134,319,000	$ 110,440,000

At June 30, 2007 and 2006, the University has received bequest intentions and certain other conditional promises to give of $30,748,000 and $14,160,000, respectively. These intentions and conditional promises to give are not included in the consolidated financial statements.

6. LONG-TERM DEBT

The various bond issues, note payable and capital lease obligations that are included in long-term debt in the statements of financial position consist of the following:

	2007	2006
The Pennsylvania State University Bonds		
Series 2007A	$ 90,570,000	$ -
Series 2007B	80,025,000	-
Series 2005	96,555,000	98,175,000
Series 2004A	59,930,000	60,980,000
Refunding Series 2003	26,260,000	28,130,000
Series of 2002	100,000,000	100,000,000
Refunding Series 2002	126,835,000	140,760,000
Refunding Series 2001	34,590,000	42,235,000
Series A of 2001	75,000,000	75,000,000
Series A of 1997	-	86,750,000
Series B of 1997	8,805,000	9,475,000
Pennsylvania Higher Educational Facilities Authority University Revenue Bonds (issued for The Pennsylvania State University)		
Series 2006	4,650,000	4,700,000
Series 2004	5,215,000	5,410,000
Series 2002	5,965,000	6,250,000
Lycoming County Authority College Revenue Bonds (issued for Penn College)		
Series 2005	15,225,000	15,555,000
Series 2003	6,495,000	9,565,000
Series 2002	29,995,000	30,325,000
Series 2000	39,370,000	39,370,000
Series 1997	11,300,000	11,530,000
Series 1993	11,954,000	11,565,000
Total bonds payable	828,739,000	775,775,000
Unamortized bond premiums	24,704,000	17,399,000
Note payable and capital leases		
Demand note payable	10,000,000	10,000,000
Capital lease obligations	16,739,000	18,026,000
Deferred lease obligation	31,324,000	-
Total note payable and capital leases	58,063,000	28,026,000
Total long-term debt	$ 911,506,000	$ 821,200,000

The Pennsylvania State University Bonds

- Series 2007A and 2007B – general obligation bonds issued in January 2007 for the purpose of funding various construction and renovation projects and for the advance refunding of the Series 1997A Bonds. The University, in conjunction with the issuance of the Series 2007B bonds, legally defeased the Series A of 1997 Bonds, with an outstanding principal of $84,540,000, by irrevocably depositing $88,341,000 in an escrow fund to be used to pay the interest accrued, maturing principal on and the redemption price of the refunded bonds. As a result of the advance refunding transaction, amounts related to the Series 1997A Bonds have been removed from the University's June 30, 2007 statement of financial position. Principal payments on the Series 2007A and 2007B bonds are due annually, in amounts ranging from $2,770,000 to $5,955,000 through August 2027, with additional payments of $11,115,000 due August 2028 and $70,905,000 due August 2036. The bonds pay interest at rates ranging from 3.55% to 5.25% and are subject to sinking fund redemption beginning August 2023 and early redemption provisions, at the option of the University, beginning August 2016.

- Series 2005 – general obligation bonds issued in January 2005 for the purpose of funding various construction projects. Principal payments are due annually in amounts ranging from $1,670,000 to $2,745,000 through September 2019, with additional payments of $15,990,000, $20,550,000 and $32,485,000 due September 2024, 2029 and 2034, respectively. The bonds pay interest at rates ranging from 3.00% to 5.00% and are subject to sinking fund redemption beginning September 2020 and early redemption provisions, at the option of the University, beginning September 2015.

- Series 2004A – general obligation bonds issued in April 2004 for the purpose of funding various construction projects. Principal payments are due annually in amounts ranging from $1,085,000 to $1,825,000 through September 2019, with additional payments of $10,625,000, $13,635,000 and $17,515,000 due September 2024, 2029 and 2034, respectively. The bonds pay interest at rates ranging from 2.50% to 5.00% and are subject to sinking fund redemption beginning September 2020 and early redemption provisions, at the option of the University, beginning September 2014.

- Refunding Series 2003 – general obligation bonds issued in March 2003 for the purpose of refunding the Refunding Series 1993A and to pay costs associated with issuing the 2003 Refunding Bonds. Principal payments are due annually in amounts ranging from $1,910,000 to $2,970,000 through March 2018. The bonds pay interest at rates ranging from 3.25% to 5.25% and are subject to early redemption provisions, at the option of the University, beginning March 2013.

- Series of 2002 and Series A of 2001 – general obligation bonds issued in May 2002 for the purpose of funding a portion of the costs of the acquisition, construction, equipping, renovation and improvement of certain facilities of the University and April 2001 for the purpose of funding various construction projects, respectively. The bonds are currently paying interest on a variable rate basis; however, the University has the option to convert to another variable rate or to a fixed rate basis (such rates are generally determined on a market basis). The bonds currently pay interest at 3.71% with adjustment on a weekly basis to the rate the remarketing agent believes will cause the bonds to have a market value equal to the principal amount up to a maximum of 12%. The bondholders have the right to tender bonds at interest rate reset dates. The University, therefore, entered into standby bond purchase agreements with banks to provide liquidity in case of tender. The principal amount of the Series of 2002 bonds is due March 2032; and the principal amount of the Series A of 2001 is due April 2031. The bonds are not subject to sinking fund redemption; however, the University has the option to redeem the bonds prior to their scheduled maturity.

- Refunding Series 2002 – general obligation bonds issued in May 2002 for the purpose of refunding the Second Refunding 1992A Series (such bonds were previously issued to refund the Second Refunding 1988 Series, 1989 Series and 1991 Series Bonds). Principal payments are due annually, in amounts ranging from $4,585,000 to $16,540,000 through August 2016. The bonds pay interest at rates ranging from 4.73% to 5.25%. The bonds are not subject to redemption prior to maturity.

- Refunding Series 2001 – general obligation bonds issued in December 2001 for the purpose of refunding the Refunding Series 1992 Bonds (such bonds were previously issued to refund the 1986 Series and the First Refunding Series of 1988 Bonds). Principal payments are due annually, in amounts ranging from $8,025,000 to $9,290,000 through March 2011. The bonds pay interest at rates ranging from 5.00% to 5.25%. The bonds are not subject to optional redemption prior to maturity.

- Series B of 1997 – general obligation bonds issued in December 1997 for the purpose of funding various construction projects and for refunding the Series 1992B Bonds. Principal payments are due annually, in amounts ranging from $700,000 to $1,090,000 through August 2016. The bonds pay interest at rates ranging from 4.60% to 5.00%. The bonds are not subject to optional redemption prior to maturity.

Pennsylvania Higher Educational Facilities Authority University Revenue Bonds (issued for The Pennsylvania State University)

- Series 2006 – Pennsylvania Higher Educational Facilities Authority University Revenue Bonds issued by the Pennsylvania State University in April 2006 for the purpose of funding the costs of sprinkler system installation and repairs in certain of the University's dormitories during the period 2006-2008, related design costs and payment of issuance costs. Principal payments are due annually in amounts ranging from $170,000 to $280,000 through September 2020, with an additional payment of $1,610,000 due September 2025. The bonds pay interest at rates ranging from 3.55% to 5.125% and are subject to sinking fund redemption beginning September 2021 and early redemption provisions, at the option of the University, beginning September 2016.

- Series 2004 – Pennsylvania Higher Educational Facilities Authority University Revenue Bonds issued by the Pennsylvania State University in May 2004 for the purpose of funding the costs of sprinkler system installation and repairs in certain of the University's dormitories during 2004-2005. Principal payments are due annually in amounts ranging from $200,000 to $325,000 through September 2019, with an additional payment of $1,905,000 due September 2024. The bonds pay interest at rates ranging from 3.00% to 5.00% and are subject to sinking fund redemption beginning September 2020 and early redemption provisions, at the option of the University, beginning September 2014.

- Series 2002 – Pennsylvania Higher Educational Facilities Authority University Revenue Bonds issued by the Pennsylvania State University in June 2002 for the purpose of funding the costs of sprinkler system installation and repairs in certain of the University's dormitories during the period 2002 through 2004. Principal payments are due annually in amounts ranging from $295,000 to $425,000 through March 2017, with an additional payment of $2,435,000 due March 2022. The bonds pay interest at rates ranging from 3.55% to 5.00% and are subject to sinking fund redemption beginning March 2018 and early redemption provisions, at the option of the University, beginning March 2011.

Lycoming County Authority College Revenue Bonds (issued for Penn College)

- Series 2005 – Lycoming County Authority College Revenue Bonds issued by Penn College in February 2005 for the purpose of refunding $7,765,000 of the Authority's College Bonds, Series of 1997, funding a deposit into the debt service reserve account, funding various construction and renovation projects and payment of costs of issuance of 2005 Bonds. Principal payments are due annually in amounts ranging from $500,000 to $1,855,000 through January 2025. The bonds pay interest at rates ranging from 3.00% to 5.00%.

- Series 2003 – Lycoming County Authority College Revenue Bonds issued by Penn College in February 2003 for the purpose of refunding $17,385,000 of the Authority's College Revenue Bonds, Series of 1993 and the payment of costs of issuance of 2003 Bonds. Principal payments are due annually in amounts ranging from $3,180,000 to $3,315,000 through November 2008. The bonds pay interest at rates ranging from 2.35% to 4.625%.

- Series 2002 – Lycoming County Authority College Revenue Bonds issued by Penn College in May 2002 for the purpose of funding various construction projects at the Penn College campus. Principal payments are due annually in amounts ranging from $345,000 to $2,775,000 through May 2032. The bonds pay interest at rates ranging from 3.80% to 5.25%.

- Series 2000 – Lycoming County Authority College Revenue Bonds issued by Penn College in December 2000 for the purpose of funding various construction projects, refunding the 1996 Lycoming County Authority College Revenue Bonds, advance refunding $4,235,000 of the 1997 Lycoming County Authority College Revenue Bonds (1997 Series Bonds), funding of a deposit to the debt service fund reserve account established under the indenture and payment of the costs of issuance of the Series 2000 Bonds. Principal payments are due annually in amounts ranging from $30,000 to $5,225,000 through July 2030. The bonds pay interest at rates ranging from 4.75% to 5.50%.

- Series 1997 – Lycoming County Authority College Revenue Bonds issued by Penn College in September 1997 for the purpose of funding various construction projects at the Penn College campus. Principal payments are due annually in amounts ranging from $275,000 to $5,010,000 through July 2018. The bonds pay interest at rates ranging from 4.90% to 5.25%. The 1997 Series Bonds were partially refunded by the 2000 Series Bonds at par amounting to $4,235,000.

- Series 1993 – Lycoming County Authority College Revenue Bonds issued by Penn College in 1993 for the purpose of undertaking a series of capital improvement projects. Principal payments are due annually in amounts ranging from $450,000 to $1,302,000 through November 2015. The bonds pay interest at rates ranging from 6.00% to 6.15%.

Maturities and sinking fund requirements on bonds payable for each of the next five fiscal years and thereafter are summarized as follows:

Year	Annual Installments
2008	$ 36,935,000
2009	37,345,000
2010	35,780,000
2011	35,600,000
2012	28,090,000
Thereafter	654,989,000

The fair value of the University's bonds payable is estimated based on current rates offered for similar issues with similar security, terms and maturities using available market information as supplied by the various financial institutions who act as trustees or custodians for the University. At June 30, 2007, the carrying value and estimated fair value of the University's bonds payable, including issuance premiums, are $853,443,000 and $845,086,000, respectively. At June 30, 2006, the carrying value and estimated fair value of the University's bonds payable, including issuance premiums, were $793,174,000 and $791,870,000, respectively. Certain bond issues have associated issuance premiums, these issuance premiums total $24,704,000 and $17,399,000 at June 30, 2007 and 2006, respectively and are presented within the statement of financial position as long-term debt. These issuance premiums will be amortized over the term of the respective outstanding bonds.

Note payable and capital leases

A $10,000,000 demand note payable bearing interest at a variable rate (4.95% at June 30, 2007) is included in the current portion of long-term debt within the statements of financial position.

The University has certain lease agreements in effect which are considered capital leases that are included as long-term debt in the statements of financial position. These leases have been capitalized at the net present value of the minimum lease payments. The University has recorded fixed assets in the amount of $26,937,000 and $27,122,000 at June 30, 2007 and 2006, respectively, representing capitalized leases. Future minimum lease payments under capital leases together with the present value of the net minimum lease payments as of June 30, 2007 are as follows:

Year	
2008	$ 2,643,000
2009	2,363,000
2010	2,146,000
2011	1,913,000
2012	1,838,000
Thereafter	15,257,000
Total minimum lease payments	26,160,000
Less imputed interest	(9,421,000)
Present value of net minimum lease payments	$ 16,739,000

The University has entered into a Master Building Sublease with ADG - Hospital Drive Associates ("ADG-HDA"), a limited partnership (of which the University maintains a 75% interest, carried at $1,329,000 and $1,202,000 in investments at June 30, 2007 and 2006, respectively), which required ADG-HDA to construct the Centre Medical Sciences Building ("Building") and lease it to the University for an initial term of twenty-five years. The Building was constructed on land jointly owned by the University and Mount Nittany Medical Center, which has been leased by ADG-HDA for a term of sixty years. The University has subleased portions of the Building to the Mount Nittany Medical Center and other healthcare related entities. The University is required to pay an annual base rent equal to the sum of (1) the principal, interest and redemption price due on the Centre County Higher Education Authority Bonds which were issued to finance the construction of the Building, and (2) an 8% return on the landlord's equity which is included above as a capitalized lease.

During 2007, TMSHMC entered into a lease agreement for a facility currently under construction located on the Medical Center's campus. As a result of certain provisions contained within the lease and related agreements, the Medical Center has accounted for the facility as an owned facility and is therefore recognizing non-cash construction costs incurred to date (included as construction in progress), together with a corresponding deferred lease obligation, as of June 30, 2007, in the amount of $31,324,000.

7. OPERATING LEASES

The University has certain lease agreements in effect which are considered operating leases. During the year ended June 30, 2007, the University recorded expenses of $23,570,000 for leased equipment and $13,541,000 for leased building space. During the year ended June 30, 2006, the University recorded expenses of $22,075,000 for leased equipment and $13,216,000 for leased building space.

Future minimum lease payments under operating leases as of June 30, 2007 are as follows:

Year	
2008	$ 14,780,000
2009	10,195,000
2010	7,208,000
2011	5,319,000
2012	4,411,000
Thereafter	27,004,000
Total minimum lease payments	$ 68,917,000

8. RETIREMENT BENEFITS

The University provides retirement benefits for substantially all regular employees, primarily through either contributory defined benefit plans administered by the Commonwealth of Pennsylvania State Employees' Retirement System and The Public School Employees' Retirement System or defined contribution plans administered by the Teachers Insurance and Annuity Association – College Retirement Equity Fund and Fidelity Investments. The University is billed for its share of the estimated actuarial cost of the defined benefit plans ($9,866,000 and $7,390,000 for the years ended June 30, 2007 and 2006, respectively). The University's total cost for retirement benefits, included in expenses, is $92,863,000 and $84,871,000 for the years ended June 30, 2007 and 2006, respectively.

9. POSTRETIREMENT BENEFITS

The University sponsors a retiree medical plan covering eligible retirees and eligible dependents. For the 2007 benefit plan year, this program includes a Preferred Provider Organization ("PPO") plan for retirees and their dependents who are not eligible for Medicare, a Medicare Advantage Private Fee For Service ("PFFS") plan and a Medicare Advantage HMO plan. In addition, the University provides retiree life insurance benefits of $5,000 at no cost to the retiree. A limited number of retirees have $10,000 of life insurance coverage; $5,000 of which is provided by the University and $5,000 is paid by the retiree.

Retirees are eligible for medical coverage and life insurance after they retire if:

- they are at least age 60 and have at least 15 years of regular full-time employment and participation in a University-sponsored medical plan immediately preceding the retirement date

OR

- regardless of age, if they have at least 25 years of regular full-time service. The last 10 of those 25 years of University service must be continuous and they must participate in a University - sponsored medical plan during the last 10 years immediately preceding the retirement date.

The retiree PPO medical plan and the $5,000 life insurance coverage are self-funded programs, and all medical claims, death benefits and other expenses are paid from the unrestricted net assets of the University. The PFFS plan and the Medicare Advantage HMO plan are fully insured. The retirees contribute varying amounts for coverage under the medical plan. As of January 1, 2007, the monthly rates ranged from $8 to $409 depending on age and dependent coverage options selected.

Effective June 30, 2007, the University adopted SFAS No. 158, *Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans* – an amendment of SFAS No's. 87, 88, 106 and 132(R) ("SFAS No. 158"). The new standard requires that the funded status of the plan be fully recognized as a net asset or liability within the statements of financial position. Additionally, SFAS No. 158 requires an employer to measure the funded status of the plan as of the date of the fiscal year-end statement of financial position. The University has historically measured and continues to measure the funded status of the plan as of June 30.

The incremental effect of adopting the provision of SFAS No. 158 on the University's statement of financial position at June 30, 2007 is as follows:

	Prior to Adoption	Effect of Adoption	As Reported
Accrued postretirement benefits	$ 730,961,000	$ 103,601,000	$ 834,562,000
Unrestricted net assets	$ 3,081,651,000	$ (103,601,000)	$ 2,978,050,000

The following sets forth the plan's benefit obligation, plan assets and funded status reconciled with the amounts recognized in the University's consolidated statements of financial position at June 30:

Change in benefit obligation:

	2007	2006
Benefit obligation at beginning of year	$ 822,552,000	$ 805,034,000
Service cost	29,693,000	40,118,000
Interest cost	48,168,000	46,604,000
Actuarial loss	72,109,000	3,877,000
Benefits paid	(29,081,000)	(28,142,000)
Plan amendment	(178,478,000)	(44,939,000)
Plan assumptions	69,599,000	-
Benefit obligation at end of year	$ 834,562,000	$ 822,552,000

Change in plan assets:

	2007	2006
Fair value of plan assets at beginning of year	$ -	$ -
Employer contributions	29,081,000	28,142,000
Benefits paid	(29,081,000)	(28,142,000)
Fair value of plan assets at end of year	$ -	$ -
Funded status	$ (834,562,000)	$ (822,552,000)
Unrecognized prior service cost (benefit)	-	(41,106,000)
Unrecognized net actuarial loss	-	176,713,000
Accrued postretirement benefit expense	$ (834,562,000)	$ (686,945,000)

Included in unrestricted net assets at June 30, 2007, are the following amounts that have not yet been recognized in net periodic postretirement cost: unrecognized prior service cost (benefit) of ($216,018,000) and unrecognized actuarial loss of $319,619,000.

Net periodic postretirement cost includes the following components for the years ended June 30:

	2007	2006
Service cost	$ 29,693,000	$ 40,118,000
Interest cost	48,168,000	46,604,000
Amortization of prior service cost	(21,629,000)	(3,567,000)
Amortization of unrecognized net loss	16,863,000	15,494,000
Net periodic postretirement cost	$ 73,095,000	$ 98,649,000

The assumed healthcare cost trend rate used in measuring the accumulated postretirement benefit obligation was 9.50% and 10.00% for the 2006-2007 and 2005-2006 plan years, respectively, reduced by 0.50% per year to a fixed level of 5.00%. The weighted average postretirement benefit obligation discount rate was 6.25% for each of the years ended June 30, 2007 and 2006, respectively.

If the healthcare cost trend rate assumptions were increased by 1% in each year, the accumulated postretirement benefit obligation would be increased by $145,204,000 and $137,520,000 as of June 30, 2007 and 2006, respectively. The effect of this change on the sum of the service cost and interest cost components of the net periodic postretirement benefit cost would be an increase of $16,311,000 and $19,146,000 as of June 30, 2007 and 2006, respectively. If the healthcare cost trend rate assumptions were decreased by 1% in each year, the accumulated postretirement benefit obligation would be decreased by $115,930,000 and $110,796,000 as of June 30, 2007 and 2006, respectively. The effect of this change on the sum of the service cost and interest cost components of the net periodic postretirement benefit cost would be a decrease of $12,664,000 and $14,813,000 as of June 30, 2007 and 2006, respectively.

The postretirement benefits expected to be paid in each year for 2008–2012 are $30,162,000, $32,259,000, $34,497,000, $37,035,000 and $39,591,000, respectively. The benefits expected to be paid in the five years from 2013-2017 are $247,686,000.

Gains and losses in excess of 10% of the accumulated postretirement benefit obligation are amortized over the average future service to assumed retirement of active participants.

The plan amendment included in 2006 reflects changes in the premium cost sharing contributions for Medicare-eligible retirees.

10. THE MILTON S. HERSHEY MEDICAL CENTER

The University's wholly-owned subsidiary, TMSHMC, owns the assets of the clinical enterprise of the Hershey Medical Center complex. The University owns the Hershey Medical Center complex, including all buildings and land occupied by the University Hospital and operates the College of Medicine. The clinical facilities of the Hershey Medical Center complex are leased to TMSHMC and TMSHMC makes certain payments to support the College of Medicine.

11. CONTINGENCIES AND COMMITMENTS

Contractual Obligations

The University has contractual obligations for the construction of new buildings and for additions to existing buildings in the amount of $459,618,000 of which $294,816,000 has been paid or accrued as of June 30, 2007. The contract costs are being financed from available resources and from borrowings.

Under the terms of certain limited partnership agreements, the University is obligated to periodically advance additional funding for private equity and real estate investments. The University has unfunded commitments of approximately $184,477,000 as of June 30, 2007 for which capital calls have not been exercised. Such commitments generally have fixed expiration dates or other termination clauses. The University maintains sufficient liquidity in its investment portfolio in the event that such calls are exercised.

Letters of Credit

The University has outstanding letters of credit in the amount of $17,328,000 and $17,976,000 as of June 30, 2007 and 2006, respectively. These letters of credit are used primarily to comply with minimum state and federal regulatory laws that govern various University activities. The fair value of these letters of credit approximates contract values based on the nature of the fee arrangements with the issuing banks.

Self-Insurance

The University has a coordinated program of commercial and self-insurance for medical malpractice claims at TMSHMC through the use of a qualified trust and a domestic captive insurance company in combination with a self-insured retention layer and is supplementing this program through participation in the Pennsylvania Medical Care Availability and Reduction of Error Fund ("Mcare Fund"), formerly the Pennsylvania Medical Professional Liability Catastrophe Loss Fund ("CAT Fund"), in accordance with Pennsylvania law. An estimate of the present value, discounted at 4%, of the medical malpractice claims liability in the amount of $72,877,000 and $71,151,000 is recorded as of June 30, 2007 and 2006, respectively.

On July 1, 2003, TMSHMC became self-insured for all medical malpractice claims asserted on or after July 1, 2003, for all amounts that are below the coverage of the TMSHMC's excess insurance policies and not included in the insurance coverage of the Mcare Fund. Under the self-insurance program, TMSHMC is required to maintain a malpractice trust fund in an amount at least equal to the expected loss of known claims. The balance of this trust fund was $16,399,000 and $15,419,000 at June 30, 2007 and 2006, respectively. TMSHMC intends to fund any claims due during the next year from cash flows from operations.

With approval from the Pennsylvania Department of Labor and Industry ("PA-DLI"), the University elected to self-insure potential obligations applicable to workers' compensation. Certain claims under the program are contractually administered by a private agency. The University purchased insurance coverage for excess obligations over $600,000 per incident. An estimate of the self-insured workers' compensation claims liability in the amount of $9,662,000 and $7,371,000 is recorded as of June 30, 2007 and 2006, respectively. The University has established a trust fund, in the amount of $9,955,000 and $9,348,000 at June 30, 2007 and June 30, 2006, respectively, as required by PA-DLI, to provide for the payment of claims under this self-insurance program. TMSHMC is self-insured for workers' compensation claims and has purchased an excess policy through a commercial insurer which covers individual claims in excess of $500,000 per incident for workers' compensation claims.

The University and TMSHMC are self-insured for certain health care benefits provided to employees. The University and TMSHMC have purchased excess policies which cover employee health benefit claims in excess of $500,000 and $300,000 per employee per year, respectively. The University and TMSHMC provide for reported claims and claims incurred but not reported.

Litigation and Contingencies

Various legal proceedings have arisen in the course of conducting University business. The outcome of such litigation is not expected to have a material effect on the financial position of the University.

Based on its operation of the University Hospital (see Note 10), the University, like the healthcare industry, is subject to numerous laws and regulations of federal, state and local governments. Compliance with these laws and regulations can be subject to government review and interpretation, as well as regulatory actions. Recently, government reviews of healthcare providers for compliance with regulations have increased. Although the University believes it has done its best to comply with these numerous regulations, such government reviews could result in significant repayments of previously billed and collected revenues from patient services.

THE PENNSYLVANIA STATE UNIVERSITY

★ 1855 ★

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THE PENNSYLVANIA STATE UNIVERSITY

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