

HOTLINE

The Princeton Plasma Physics Laboratory is a United States Department of Energy Facility

PPPL'S Qin Awarded Presidential and Department of Energy Prizes



Hong Qin (left) and DOE Office of Science Director Ray Orbach during the DOE Award ceremony on June 13.

PPPPL physicist Hong Qin received the Presidential Early Career Award for Scientists and Engineers at a ceremony in Washington, D.C., June 13. Qin was among 58 researchers supported by eight federal departments and agencies who received the award. The Presidential award is the highest honor bestowed by the U.S. government on outstanding scientists and engineers who are beginning their independent careers.

Each Presidential award winner received a citation, a plaque, and a commitment for continued funding of their work from their agency for five years. John H. Marburger III, Science Advisor to the President and Director of the Office of Science and Technology Policy, presented the awards.

Qin also received the DOE's Office of Science Early Career Scientist and Engineer Award at a separate ceremony June 13 at DOE Headquarters. He was among six from

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Intense Effort Brings MG-2 Back On-line

By Anthony DeMeo

Following an eight-year sleep, D-Site Motor Generator (MG-2) has been successfully awakened. The unit had not operated since the last experiments on the Tokamak Fusion Test Reactor (TFTR) in April 1997. In January of this year, PPPL engineers, technicians, and members of the Laboratory's Emergency Services Unit (ESU) began a three-month effort, working around the clock at times, to bring MG-2 back into operation for the start of NSTX operations this spring.

"Until now, NSTX's power requirements have been satisfied entirely by MG-1. However, for greater flexibility with future experimental operations, we were asked to determine the work needed to allow both motor generators to be available. As it turned out, bringing MG-2 back online

was a rough road. Many problems had to be solved along the way," noted Mounir Awad, Head, MG section.

The D-site motor generator sets were originally built for TFTR, which required power supplies equivalent to those of a U.S. city with a population of a half million. Unlike the C-Site MG's, which run horizontally, the D-site units are vertical and mostly enclosed in pits below grade level. The only visible part of the two D-Site MG sets is a 15,000-HP motor on top of each MG. Each motor is connected by a shaft to its own 600-ton flywheel, which also serves as the rotor of a 475-MVA generator. The motor draws energy directly from the local utility and is capable of bringing the flywheel/rotor from a stopped condition to

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MG-2

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375 revolutions per minute in less than 20 minutes. During a startup, each motor generator set stores enough energy to lift a 2200-ton destroyer 700 feet in the air.

Both MGs were operated successfully during TFTR's 14-year life, many times at or slightly above, their rated speed. According to Senior Engineer Gene Baker, "Due to their 600-ton rims, these machines are highly stressed at full speed. The rotor surface speed on the outside of the rim reaches 329 miles per hour. GE, the manufacturer of the MG sets, once gave me a figure of 800 G's of centrifugal force at that speed. That means that the 600-ton rotor was trying to push outward at 800 times its weight. That's a lot of outward force on the rim of the rotor."

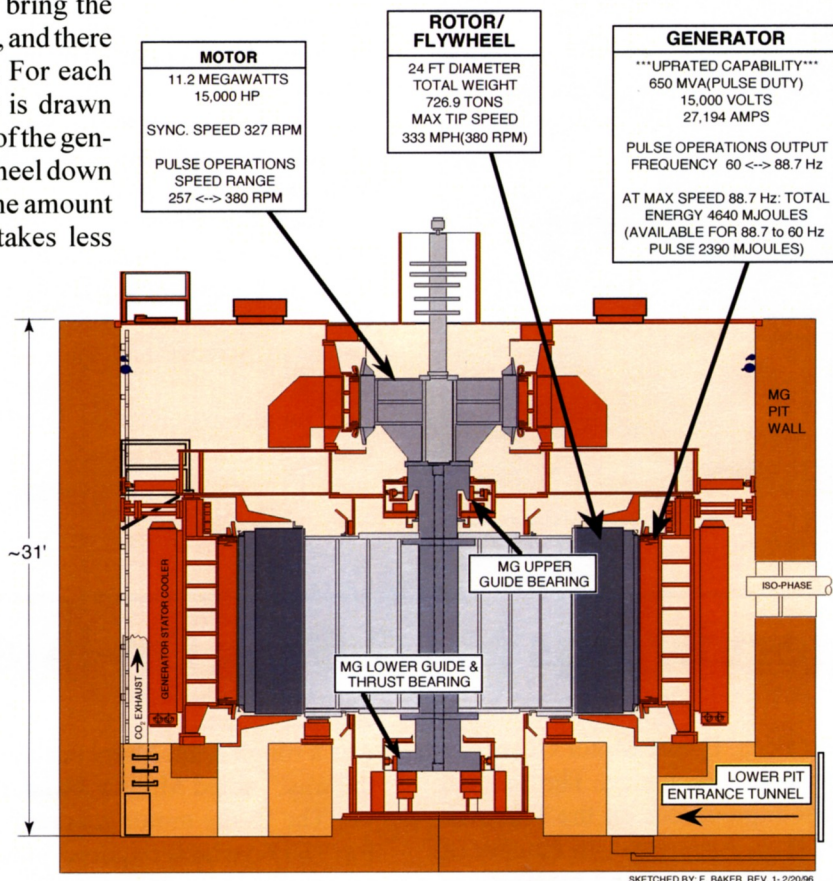
Since NSTX is a smaller experiment than TFTR, only a portion of the power capability of one MG is needed for its operation. "We usually bring the MG up to about 280 rpm, and there it remains all day long. For each NSTX plasma, current is drawn from the stator winding of the generator, slowing the flywheel down to lower rpm based on the amount of energy released. It takes less than a minute to bring the rotor back up to 280 rpm," said Gene Baker. The alternating current drawn from the generators is rectified to direct current as needed for each of the nine NSTX magnetic coil systems. This power conversion is carried out in the Field Coil Power Conversion building, adjacent to the former TFTR test cell.

Part of the effort to return MG-2 into service included a thorough inspection of the

unit. These examinations eventually resulted in the discovery of cracks in welds on both sets. "When we inspected MG-2 during the re-commissioning, we found several unexpected weld cracks between the 'spider webs' or spokes of the rotor spider and its lower support structure. The lower support structure consists of a steel plate that runs around the bottom of the rotor and a stiffening ring that is welded against the webbing. Once we knew the location of the cracks on MG-2, we went right away to MG-1 and looked at the same location, and indeed there were similar cracks," according to Mounir Awad. Further checks found more cracks in both units that would soon need repair. GE and PPPL performed an analysis to find the root cause of these cracks and also to evaluate the feasibility of continuing operation and monitoring the status of the weld cracks.

While none of the cracks in MG-1 required immediate shutdown of the unit, each crack was catalogued and checked during each maintenance week. According to Gene Baker, "As we operated MG-1 for NSTX, the cracks continued to increase at a slow rate, so we knew that eventually an extended shutdown of MG-1 would be necessary to perform repairs. This meant that MG-2 had to be returned to operational condition for use on NSTX."

The restoration of MG-2 began with a thorough inspection. "Like a car in the garage that hasn't run for eight years, you really have to look at everything. So there was a big effort by the MG crew to calibrate all of the items in the MG pit, and we were over there for quite a few months," noted Baker. "While work on other MG-2



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PPPL'ers involved in the MG-2 Project are, from left (seated), William Zimmer, Colin McFarlane, Steven Jurczynski, Geoff Gettelfinger, and Mounir Awad; (standing) Steve Tureikas, John Boscoe, Carl Bunting, Bill Slavin, Harry Krotz, and Gene Baker.

systems continued, a decision was made to refurbish some of its weld cracks. This repair was prefaced by extensive preparations for the work in the 15-foot-deep pit, including the development of procedures for rescuing workers in the event of an emergency or a medical problem.

Mounir Awad noted, "The preparations took more time than the actual repair work itself, amounting to about 90 percent of the job." Before the work commenced, members of the PPPL Emergency Services Unit (ESU) practiced the retrieval of staff. They remained present throughout the effort. Retrieval apparatus was set up on the deck of the MG set to facilitate rapid extraction, if necessary.

To add to the complexity of refurbishing the welds, access into the welding area was entirely through a three-foot opening under a metal plate at the top of the MG set. Not only did the repairs require PPPL personnel to work in a confined space, but the cracks that needed welding were difficult to reach, requiring creative workarounds. In addition, care had to be taken to insure that nearby components were protected from sparks and metal filings produced during grinding and welding operations. Fireproof shield walls and tarps had to be maneuvered in the cramped workspace as protection.

"Following work, staff had to go in with vacuums to make sure all of the metal filings were removed, because

metal filings will do 'wonderful things' in electric fields," quipped Baker.

"We had a lot of support from different groups and coordination went very well," noted Awad. People involved included technicians Colin McFarlane, Harry Krotz, Steve Tureikas, and Carl Bunting. Steve Jurczynski performed the welding with the assistance of Bill Zimmer. Project engineers included Bob Parsells, Geoff Gettelfinger, and Larry Dudek with support from Al von Halle and Mike Williams. Jim McGuire coordinated the around-the-clock presence of the PPPL ESU, without which work could not be undertaken. Bill Slavin and Margaret Lumia of the PPPL Safety organization lent their essential expertise.

After the completion of weld restoration in three locations, the MG-2 was ready for electric testing, including start-up. A reduced generator output voltage, while the set is idling between NSTX pulses, was implemented to reduce energy cost. Equipment protection under this mode was implemented by Gene Baker and Alex Ilic.

Since April, MG-2 has been providing NSTX with the required power and energy with excellent reliability. Meanwhile, planning is underway for the complete restoration of MG-1's weld cracks in the next few months. This will bring the MG-1 to its original full power capability. ●

DOE national laboratories to receive the Office of Science honors, as well as the Presidential award.

"The Department of Energy is proud that these researchers are making important contributions, in a wide range of fields, to innovation and technology for energy, economic and national security," Secretary of Energy Samuel Bodman said. "If the outstanding efforts of these scientists and engineers are any indication of the future, I have no doubt they will ensure America's scientific leadership far into the next century."

Both the Presidential and DOE awards cite Qin for his contributions to the physics of high-intensity particle beams, with application to ion-beam fusion energy, and for his work on electromagnetic effects in magnetically confined plasmas, with application to magnetic fusion energy.

In the nomination letter, PPPL's Ron Davidson and Bill Tang noted their close collaboration with Qin since 1998, in both the nonlinear and beam dynamics and gyrokinetic areas, and "have only the highest opinion of his scientific

accomplishments, intellectual capability and creativity, and potential for continued significant contributions as a theoretical physicist." PPPL Director Rob Goldston also signed the letter.

Goldston, Tang, and Davidson described Qin as a "star performer" who has made seminal scientific contributions and an "extremely versatile theoretical physicist" with a strong publication record that includes 48 refereed publications, including 19 first-author publications.

"Dr. Qin's range of scientific accomplishments and his versatility as a theoretical physicist are extraordinary, including his analytical capabilities, numerical simulation capabilities, broad physics interests and technical expertise, and very strong collaborative and interpersonal skills," the nominators said.

After receiving a B.S. and an M.S. in space physics from Beijing University, Qin came to Princeton University, where he earned a Ph.D. in astrophysical sciences in 1998. He conducted postdoctoral research at PPPL, and then joined its research staff in 2000. Presently, he is a Research Physicist in PPPL's Theory Department and the Nonlinear Beam Dynamics and Nonneutral Plasma Division. ●

PPPL Lauded for Pollution Prevention and Environmental Stewardship



The DOE Office of Science recently honored PPPL and five other national labs for their pollution prevention and environmental stewardship during 2004. PPPL was recognized for its "Noteworthy Practices" in these areas for "attaining, ahead of schedule, the Fiscal Year 2010 DOE Municipal Solid Waste Recycling Rate Goal of 50 percent." From left (standing) are PPPL Director Rob Goldston (holding the DOE pollution prevention award), Margaret Kevin-King, Thomas McGeachen, Kareem Armstrong, James Nah, Steven Green, and Jack Anderson; (seated) Calvin Armstrong, Antonio Morgado, and Don Perez. Goldston, Anderson, King, and McGeachen presented certificates to the others for their efforts in reaching this goal. The recycling rate goal at PPPL for Fiscal Year 2005 is 55 percent!

Finley Named Sexual Harassment Designated Individual for PPPL

Virginia Finley is the Sexual Harassment Designated Individual for PPPL. She replaces Dori Barnes and joins PPPL's Erik Perry in this capacity.



The primary role of the designated individual is to see that the institution responds promptly and fairly to complaints of sexual harassment. Designated individuals are able to answer questions, provide guidance, discuss options, mediate informal complaint resolutions, and, when necessary, refer persons to other appropriate resources.

Finley can be reached at ext. 2746 or vfinley@pppl.gov. For more information about the subject, go to http://www.princeton.edu/uhs/ss_share.html, the University's site for SHARE [Sexual Harassment Advising, Resources, and Education]. ●