



INL's Space Nuclear Systems and Technologies Laboratory assembles radioisotope power systems, or "space batteries," which provide nuclear energy to power NASA spacecraft and rovers that venture into deep space to perform scientific missions.

Team's enthusiasm, work ethic fuel construction of nuclear space batteries

By Casey O'Donnell, *INL Nuclear Science & Technology intern*

Sitting among the women of Idaho National Laboratory's Space Nuclear Systems and Technologies Laboratory, Carla Dwight, the program's deputy director, deemed the group "a room full of extroverts."

She wasn't kidding.

From the second they sat down, the women supporting INL's Space Nuclear program displayed almost as much energy as the power systems they construct. They joked about everything from the room's "missing" chairs to their matching, custom-made T-shirts (made especially for the occasion). They laughed at each other's stories and never missed a chance to crack jokes at each other's expense. They also jumped at the opportunity to congratulate two of their own — Kelly Lively for her recent alumnus-of-the-year award from Idaho State University, and Cathy Gonzales for recently completing her bachelor's degree in business management from University of Phoenix.

In short, as Dwight said, "More than any other program, Space Nuclear really is like a family."

This close relationship is understandable given the demanding nature of the Space Nuclear program's work. The team constructs radioisotope power systems, or "space batteries," that provide the nuclear energy to power NASA spacecraft and rovers that venture into deep space to perform scientific missions. This kind of project requires the highest level of teamwork, and collaborating so closely is bound to create a unique bond.

"It's a very detailed process," Kelwant Kaur Bhag Singh explained. Building the power system takes three to five years and involves a slew of experiments including vibration testing, magnetic testing, mass properties testing and thermal vacuum testing. There's little room for error and the deadline is strict: postponing a launch a few months could delay the arrival of a rover or spacecraft by several years due to the movement of the planets.

With such a high-stakes atmosphere, it's not surprising that the team's lighthearted banter sometimes gives way to more serious attitudes. Bhag Singh described the tense days during which highly skilled nuclear operators lower the radioisotope modules into the generator through the use of manipulators. The process is painstakingly slow, and other than the sounds of work, the lab is silent. The gravity of the scene leaves no question regarding the care and diligence with which the team members approach their work.

The women of INL Space Nuclear

Carla Dwight is the Deputy Director of Space Nuclear Systems and Technologies.

Kelly Lively is the Department Manager of Radioisotope Power Systems.

Kelwant Kaur Bhag Singh is the Subject Matter Expert for Mass Properties Testing and Magnetics Testing.

SueAnn Keller is a Quality Inspector.

Amy Powell is a Quality Engineer.

Patti Simons and Cathy Gonzales are Administrative Assistants.



Left to right: Carla Dwight, Kelly Lively, Amy Powell, Kelwant Kaur Bhag Singh, SueAnn Keller, Cathy Gonzales and Patti Simons.

After years of such tireless effort, the Space Nuclear team completes the power system. Yet even then, the team's work isn't finished. "We're a full-service lab," Lively joked, "so once we finish the battery, we even transport it to NASA."

After delivering the power system to Kennedy Space Center, a few members of the INL team stayed for several months to take care of it. Even though this meant spending almost 100 days in Florida, Amy Powell pointed out that the trip certainly wasn't a vacation. The team worked endlessly, continuing to monitor the performance of the radioisotope power system until attaching it to the rover or spacecraft about 10 days before the launch.

When asked whether they consider their jobs captivating, the women cited various aspects of their work they find to be particularly thrilling. Patti Simons mentioned that "every day brings a new challenge." Cathy Gonzales added, "It's exciting to work with so many talented people." When asked to name the most exciting thing about their jobs, the team agreed that one aspect of their

work far surpasses the others: watching the rocket launch.

Lively and Powell were present for the launches of both Pluto's New Horizons spacecraft (2006) and the Mars Curiosity rover (2011), the two spacecraft the team has powered. SueAnn Keller joined them for the 2011 launch. The other team members have watched the launches at viewing parties back home in Idaho Falls.

"We were all on pins and needles when the countdown actually started," Dwight said. "And when the rocket took off and then roared out of visual sight through the sky, it was a truly profound and proud moment--several of us had tears of joy running down our cheeks as we clapped and cheered."

Powell echoed her sentiments, describing the launch as the culmination of all of the team's efforts. "Seeing the mission equipment power up using energy supplied by devices we at INL had assembled and tested gave a sense of pride and completion to many years of hard work," she said.

Even now, the team keeps a close eye on the progress of New Horizons and Curiosity, knowing that their work is helping to open new doors in space research. Looking forward, they plan to build another radioisotope power system for the Mars rover set to launch in 2020.

Meanwhile, the team keeps busy with qualification training and updating and maintaining equipment.

It's not surprising that the women of Space Nuclear consider their work both demanding and enormously rewarding. "One thing I see is that we carry our ownership with great pride in this program, and it brings me joy to be a part of it," Keller said. Reflecting on her time with both the people and the work in the lab, Dwight added, "I'm still waiting for a dull moment."

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SueAnn Keller (red shirt) and Kelly Lively (black t-shirt), gathered with INL employees and family members near Florida's Cape Canaveral Air Force Station to watch the Nov. 26, 2011 Atlas rocket launch.