

The International Space Station is about to get major power upgrade

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KENNEDY SPACE CENTER, Fla. – This week the International Space Station will get a set of upgraded solar arrays to power the station, providing the juice needed to keep the orbiting laboratory going for the rest of its lifecycle.

The space station is a full-time laboratory hosting hundreds of experiments at once along with the six or seven astronauts living in the orbiting six-bedroom home, and to keep all that going takes a lot of power.

Currently, the ISS has eight solar arrays that generating about 160 kilowatts of power total. It's been more than 20 years since the first solar arrays were installed on the ISS and even with upgrades, solar cells degrade overtime.

The new Roll-Out Solar Arrays, or ROSA, are much smaller--but more powerful with new technology— and will eventually provide 120 kilowatts, or 120,000 watts, of power during the daylight hours.

The first two out of six ROSAs will launch Thursday from Kennedy Space Center at 1:29 p.m. in a SpaceX Cargo Dragon spacecraft as it delivers more than 7,200 pounds of supplies, hardware and experiments to the ISS.

Rick Golden, Boeing project manager, oversees the structural mechanical development projects for the space station, including power. Upgrading the ISS power system, from the new batteries made by Boeing installed in the last few years to the new solar arrays will enable the station to operate for years to come.

Living in Earth's gravity with plenty of oxygen and livable temperatures takes about 877 kilowatts (.877 watts) hours per month, according to the U.S. Energy Information Administration. A small refrigerator uses about 725 watts (.725 kilowatts), according to NASA.

In low-Earth orbit away from those comforts of terrestrial life, the International Space Station must provide those life-supporting services for the astronauts who live and work in space year-round. This takes substantially more power, the equivalent of powering up to 40 houses on Earth, according to Redwire Space, the space manufacturing company based in Jacksonville that built the new arrays and tested their deployment for Boeing.

The new solar arrays are essentially large blankets with more than 9,000 solar cells on each one attached to carbon composite boom arms. The massive arrays are rolled up to launch in the Dragon cargo spacecraft and then, through two spacewalks, will be installed outside the ISS. Golden explained that the way arrays are rolled up it looks like a big carpet and the arrays can be deployed in minutes, immediately ready to start turning sunlight into energy.

“The rollout technology has these two fiber composite booms that look like giant straws, they’re seven and a half inch diameter and 60 feet long, and it just pulled this blanket out. Much like you’d see, you know, a roll of carpet rolling out, it just pulls it out,” Golden said.

European Space Agency’s Thomas Pesquet and NASA’s Shane Kimbrough will be spacewalking to install the arrays during the dark side of the ISS orbit. The astronauts will pull out the four flight release bolts in orbit and then the arrays unfurl in space.

“It just pulls it out, and it is powerless. There’s no telemetry to it, it’s a very simplistic approach. And then once it’s out, the sunlight will hit the PV (solar cells) and they’ll start generating power,” Golden explained.

Redwire Space acquired Deployable Space Systems in February, the manufacture of deployable solar array systems.

“When all those six are flown and attached, the space station will actually be generating 20 to 30% more power than it was originally generating,” Redwire COO Andrew Rush said. “Which is really, really exciting because of the amount of science and commercial exploration and human exploration and operations activities that we’ll be able to support with that much more power on all that.”

Over three resupply missions, SpaceX will carry two of the giant arrays up at a time to the ISS. Each pair will require two spacewalks to install.

Rush said the Redwire Space team is excited for launch but the day the arrays are installed will be their second “bated breath moment.” The team will get to watch the spacewalk in real-time as their hard work is put to use powering the ISS.

“You get the launch, and that’s public, everybody watches that but the normal operations, you know, that installation and deployment, that you also get to see in real-time, and that’s a little bit different than, like satellite operations, right?” Rush explained.

Redwire also provides technology for space satellites and a number of other spacecraft. For those missions, knowing it was successful is not always quite so visible as it is with all the available views from the ISS.

“You don’t always get to see how everything did, and obviously you get to check that out and you get telemetry with this, like, it’s very visual, and supporting the ISS,” Rush said. “So that’ll be exciting to see and really just amazing to see the years of work that members of the team put into this and see it, you know, see it come to fruition with this, is, I’m very, very proud and excited for them for that.”

Not only will the arrays be installed live on NASA TV but anyone in the world can look up and see them clearly using a telescope, Golden said.

“This is one we can actually see from the ground,” Golden said. “So our space enthusiasts they can see space station, and watch space station and track it, this is kind of exciting, because you can actually see arrays, you know, with the right telescope, so it’s kind of neat, that we put things on the outside, but this is big enough on the outside that will actually be able to see it from the ground.”

Using NASA’s “Spot the Station” website anyone can find out when the ISS will be flying over their hometown and by the end of June will be able to see the two new arrays.

The spacewalk to install the first two arrays is scheduled for June 16 with Pesquet and Kimbrough. The astronauts will spend about 6 1/2 hours outside the ISS installing the ROSAs and then finish the job on Sunday, June 20.

For the teams at Boeing and Redwire, the installation has been years in the making which faced some delays due to the coronavirus pandemic. Teams had to overcome supply chain obstacles much like other industries around the world this past year.

“To actually see it go, you know, it’s kind of one of those career moments where you get to see your baby grow up,” Golden said. “So that’ll be really fulfilling for me, and exciting.”

The next pair of ROSAs will launch in spring 2022 and about a year later the final two will go up.

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