



Graphic from Raytheon - Drones beaming power from Ground Station to each other back to Ground Receivers

## This changes Everything!

DARPA has tapped Raytheon to design and develop a wireless, airborne relay system to "deliver energy into contested environments," as part of its Energy Web Dominance program, in which DARPA wants to be able to power anything from nearly anywhere.

Under a two-year, US\$ 10 million DARPA contract, Raytheon will create a [Persistent Optical Wireless Energy Relay \(POWER\) system](#), using a series of high altitude unmanned aircraft equipped with laser-based power receiving and transmitting capabilities. Energy will be beamed up to high altitude, then relayed across however many jumps are necessary to reach the target area.

That target might be on the ground, or it might itself be another autonomous aerial platform, in which case it could stay airborne as long as necessary, its batteries being constantly charged from afar.

With enough of these power-relaying birds in the air, the POWER system creates an "energy web" that military logisticians can use to route energy where it's most needed at a moment's notice. It's a supply line in the sky, capable of giving land, sky or sea-based robots indefinite endurance, or sending the same energy elsewhere if it's strategically necessary.

"This is the internet for energy, harnessing resilient, multipath networks to flow energy from abundant sources to energy-starved consumers," said Col Paul Calhoun, POWER program manager in DARPA's Tactical Technology Office. "The military faces particularly acute energy challenges, which are driving this innovation. We often must operate far from established energy infrastructure and rely on liquid fuels that require precarious supply lines."

There is of course a drawback, and in this case it's the fact that you're throwing a fair amount of energy away to gain that flexibility. You lose some – maybe around 20% – when you convert electricity to light in your laser. You lose more – maybe 50% – when you convert that laser back to electricity at the receiver. And in this kind of relay station set up, you'd lose that power at every step of the way.

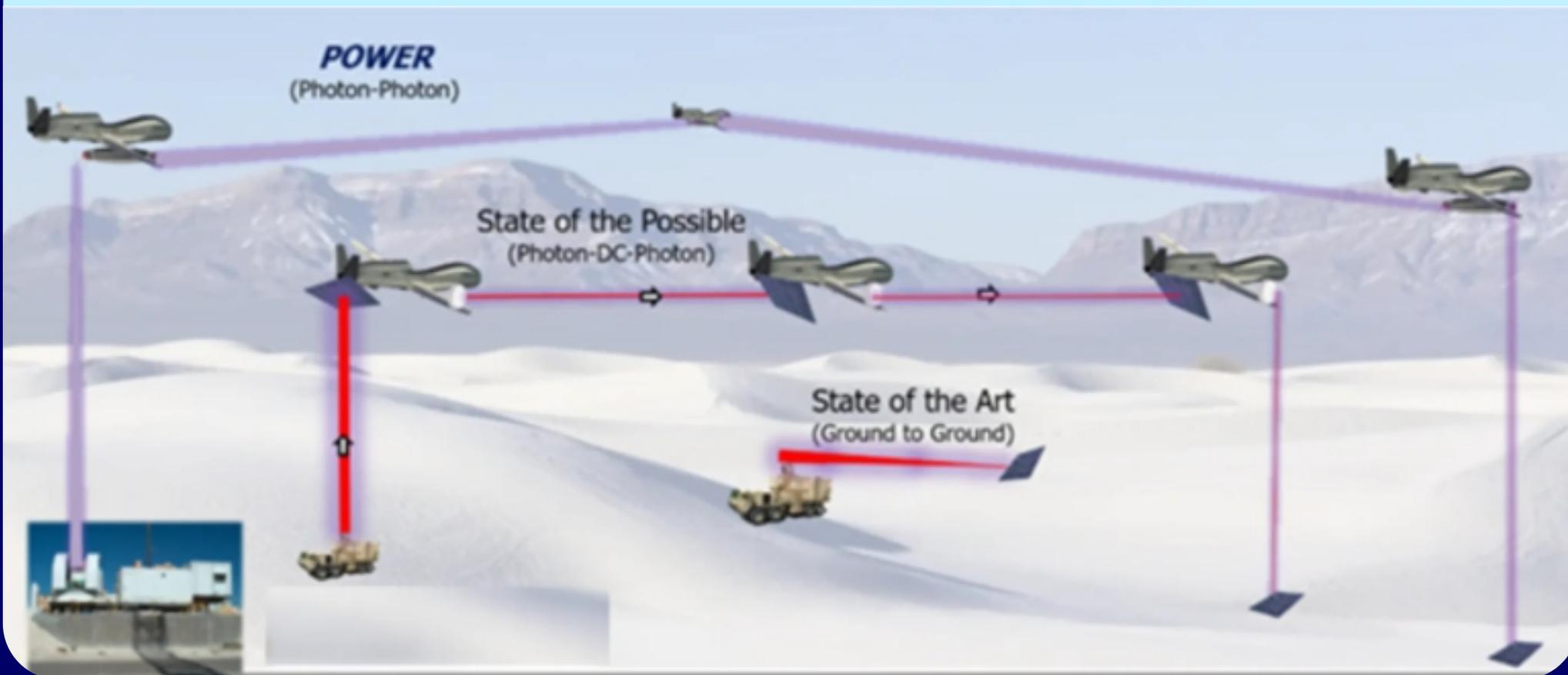
Mind you, plenty of energy is already spent moving fuel around, from refineries to tankers to trucks – and this kind of airborne supply line would eliminate the personnel risk normally involved with moving energy around in a war zone. And you can beam this power over from a spot where it's easy and convenient for you to produce it in bulk – potentially even just grabbing it straight out of the nearest power grid – so efficiency is probably well down the list of priorities.

DARPA seems bullish on the technology, not just for military purposes, but for distributed power in civilian life as well. "We believe the next energy revolution will be enabled by the wireless energy web," said Calhoun. "It will dramatically compress transport timelines and resiliently provide distributed energy to consumers in air, on land, on the sea, undersea, and in space." Source: [Raytheon](#)

The implications of this technology, first trialled by Nikola Tesla a hundred years ago will have far reaching implications in our society for many years to come.

Being developed for Defense Forces, P.O.W.E.R. can also be deployed beyond the battlefield for more humane purposes.

These pages will show some of the extensive changes to our society based entirely on this technology, beyond the delivery of energy to the Armed Forces.



**ENERGY**

**P**ERSISTENT **O**PTICAL **W**IRELESS **E**NERGY **R**ELAY

**NEWS  
RELEASE**



<https://raytheon.mediaroom.com/2023-12-12-RTX-to-create-network-of-energy-webs-for-DARPA>

Perhaps one day soon we'll be able to drive into our garage and "aim" a laser at our car to recharge it... or perhaps future cars could have a satellite receiver to accept power from drones or satellites while driving.

In the meantime, specialized vehicles can act as mobile recharging stations, or franchise operators can provide power to vehicles from their satellite receiver.

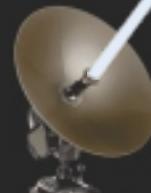


A Power Laser is sent to the drone, which is then able to bounce, re-aim or re-send that laser to another station, which can be mobile, flying or static.

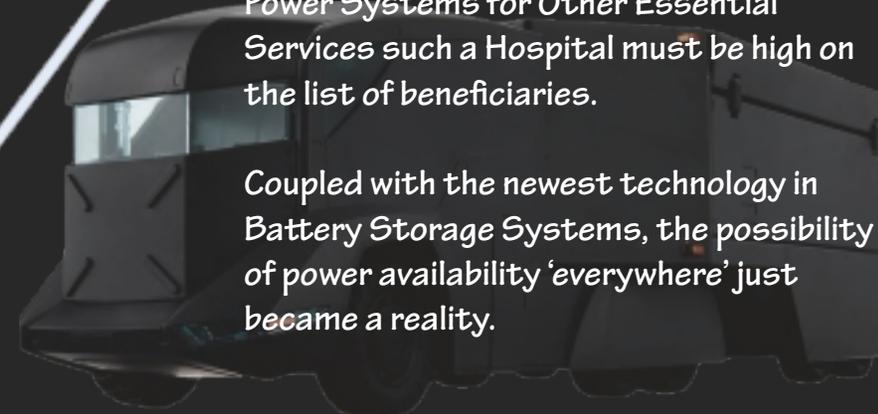
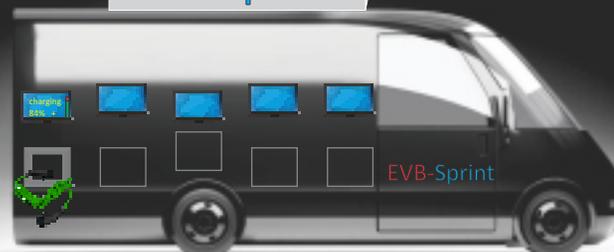
In this example, power is sent to a mobile EV charging station which can in turn, power other vehicles, recharge Auxiliary Battery Cells or distribute power back into a local grid.

The implications for Disaster Relief are obvious. Hardening or creating Redundant Power Systems for Other Essential Services such as a Hospital must be high on the list of beneficiaries.

Coupled with the newest technology in Battery Storage Systems, the possibility of power availability 'everywhere' just became a reality.



EVB-Sprint



## 15 Second UHD Video sent 19 Million miles in 101 seconds

NASA has sent an ultra-high definition, 15-second-long cat video over 19 million miles (over 30 million km), the space agency said on Monday. This was not done for fun, though the video choice is undoubtedly some in-joke, but rather an experiment for its Deep Space Optical Communications. The video was beamed to Earth from its \$ 1.2 billion Psyche asteroid probe launched in October 2023.

### Cat vids over the void

The probe is on a six-year-long mission and is set to travel around 2.2 billion miles (3.6 billion km) during its mission. Psyche is scheduled to rendezvous with a rare, metal-rich asteroid that may explain how the cores of rocky planets like Earth first formed. The video of a cat called "Taters" was uploaded to the probe before launch and was sent to Earth on December 11 as a side mission to its main task.

"One of the goals is to demonstrate the ability to transmit broadband video across millions of miles. Nothing on Psyche generates video data, so we usually send packets of randomly generated test data," Bill Klipstein, the tech demo's project manager at JPL, said. "But to make this significant event more memorable, we decided to work with designers at JPL to create a fun video, which captures the essence of the demo as part of the Psyche mission," he added.

CBS News reports that NASA announced that it has used a flight laser transceiver to transmit a video from the Psyche spacecraft to the Hale Telescope at Caltech's Palomar Observatory in San Diego County, California. The video was transmitted as an encoded near-infrared laser and covered a record-setting distance of about 80 times the distance between Earth and the Moon. It took only 101 seconds for the laser to reach Earth.

The 15-second test video was transmitted via a flight laser transceiver at the system's maximum bit rate of 267 megabits per second (Mbps). The transmission took 101 seconds to reach Earth. The video was downloaded and sent to NASA's Jet Propulsion Laboratory in Southern California, where it was played in real-time for analysis.

"Despite transmitting from millions of miles away, it was able to send the video faster than most broadband internet connections," Ryan Rogalin, the project's receiver electronics lead at JPL, said. "In fact, after receiving the video at Palomar, it was sent to JPL over the internet, and that connection was slower than the signal coming from deep space," he added.

NASA has declared the successful transmission of a video as a "historic milestone." As the spacecraft Psyche continues its journey towards the asteroid belt between Mars and Jupiter, it will send high-data-rate signals back to Earth. This enhanced communication capability from deep space could play a crucial role in the future of human space exploration, including potential missions to Mars.

### A NASA milestone

"This accomplishment underscores our commitment to advancing optical communications as a key element to meeting our future data transmission needs," NASA Deputy Administrator Pam Melroy said. "Increasing our bandwidth is essential to achieving our future exploration and science goals, and we look forward to the continued advancement of this technology and the transformation of how we communicate during future interplanetary missions," she added.

<https://www.jpl.nasa.gov/news/nasas-tech-demo-streams-first-video-from-deep-space-via-laser>