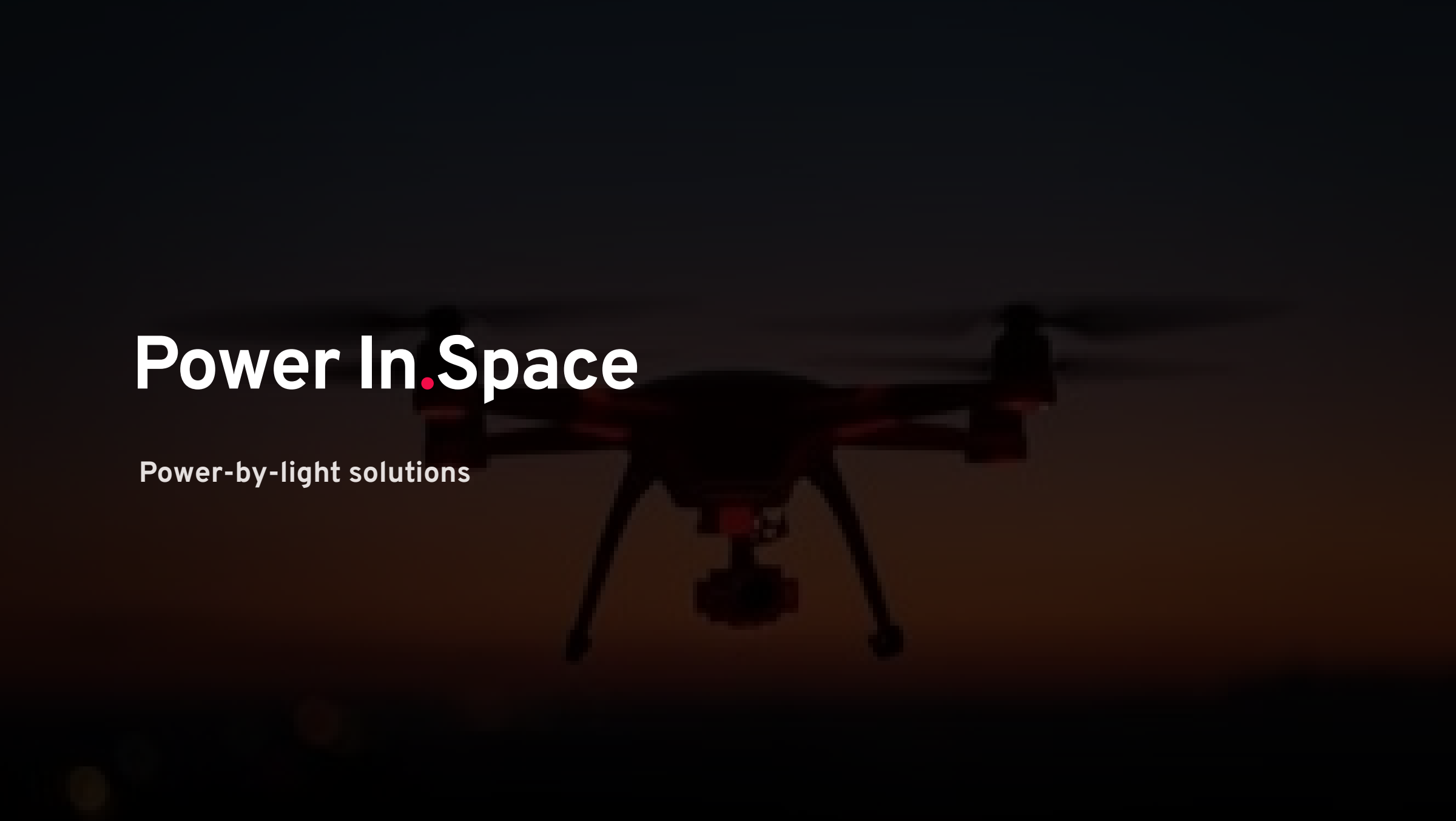


Power In.Space



Power-by-light solutions

Today's power constraints are limiting...



Battery limits

Limited operation time
due to battery constraints



Remote power

Lack of remote power in
hard-to-reach areas



Recharge delays

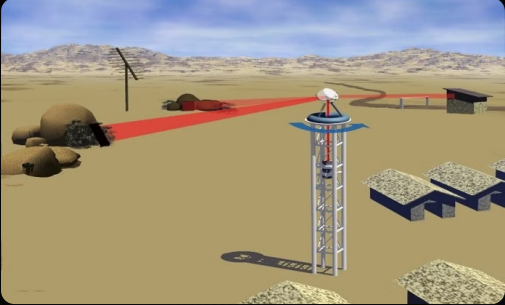
Delays from recharging &
battery swaps



Payload impacts

Heavy batteries reduce
payload capacity

Laser-based Energy unlocks continuous power supply



Automated beam alignment



Reduced onboard battery, increasing payload capacity

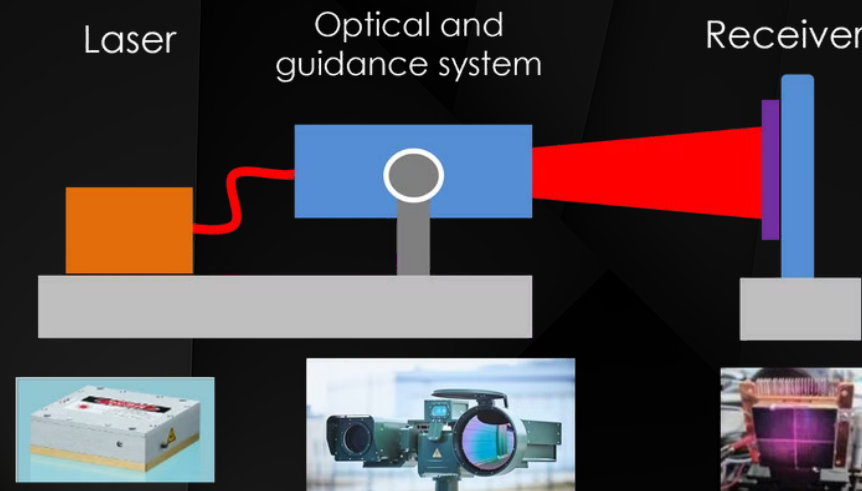
Sustained energy for robotics



Power and data transfer capabilities in one

Technology Overview

Long range wireless **laser power beaming** for continuous energy transmission



Features:

- **Range:** Up to 10 km on Earth, 1000 km in space
- **Power Output:** Up to 5kW
- **Efficiency:** Up to 30%
- **Safety:** Automatic instant power cut-off
- **Targeting:** Automated tracking of moving objects
- **Turbulence Handling:** Advanced receiver to manage atmospheric turbulence

UAV power beaming solution

Receiver

- Power Density: 1 kW/kg (1 kW – output power)
- Energy Density: Infinite (no time/fuel limit)
- Up to 10 min to 80% battery charge (custom battery)

Transmitter

- 20,000+ hour lifetime
- Tracking and guidance system
- Laser communication channel, up to 100 Mb/s

Limitations

- Line of sight and Weather (heavy rain/dense fog)



Prototypes, UAV power beaming

Current

Output - 20 W

Source - 100 W laser

Receiver weight – 15 g

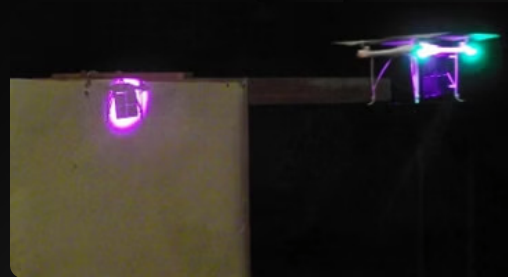
Range – up to 100 m

Drone weight - 150 g

Drone size - 30 cm

Guidance

Lab environment



Next

Output - 80 W

Source - 300 W laser

Receiver weight – 100 g

Range – up to 300 m

FSO link – 10 Mb/s

Guidance

Outdoor environment

[demo_video](#)

Drone solutions comparison

Year of work, DJI Inspire 2 (25 min flight, 90 min charge, 2 min take-off/landing, 1 min battery swap); low-quality work rate: \$10/hour; electricity price: \$0.20/kWh

Charging pad

Operation time $\sim 365 \times 5$ h

Cost $\sim$ Station (30000\$),
electricity ($365 \times 24 \times 0.3 \times 0.2$) =
30525\$

1 operation hour cost $\sim 16.7\$$



Battery changing

Operation time $\sim 365 \times 20$ h

Cost $\sim$ 4 batteries ($4 \times 150\$$), 4
chargers ($4 \times 50\$$), worker
(\$87,600/year), electricity
($365 \times 24 \times 0.2 \times 0.2$) = 88400\$

1 operation hour cost $\sim 12.5\$$

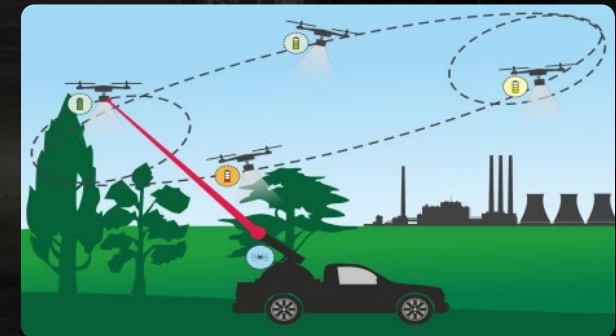


Laser power beaming

Operation time $\sim 365 \times 24$ h

Cost $\sim$ power beaming hardware
(81000\$), service (4000\$),
electricity ($365 \times 24 \times 3 \times 0.2$) =
90025\$

1 operation hour cost $\sim 10.3\$$



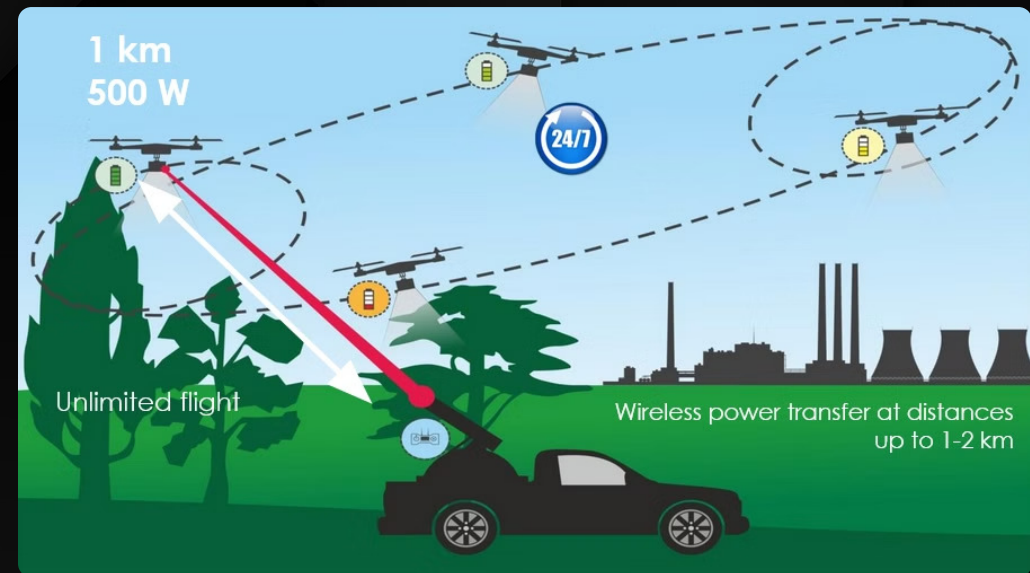
Drone Applications

Key Industries

- Security and Surveillance
- Search and Rescue Operations
- Maritime and Offshore Monitoring
- Telecommunications and Connectivity
- Environmental Monitoring in Remote Areas
- Military and Intelligence Gathering
- Real-time Infrastructure Inspection
- Scientific Research and Meteorology
- Wildfire Monitoring and Firefighting
- Urban Traffic Management

Advantages

- Uninterrupted missions
- Enhanced safety - no need to land
- Scalable for multiple drones
- Free space-optical communication
- Extended operational range



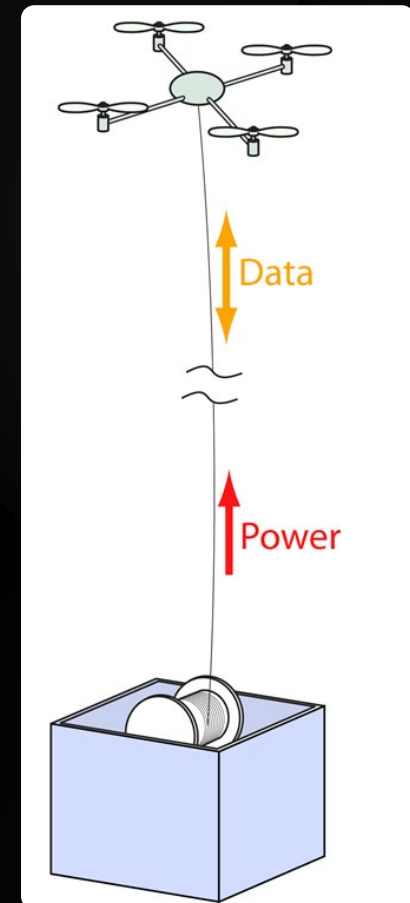
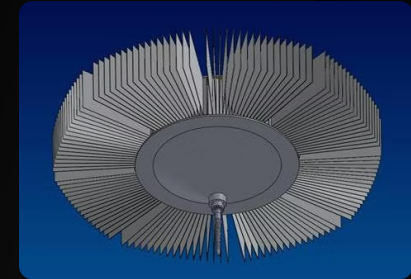
Power-over-fiber for robotics

Instantly deployable observation and communications tower

Laser power delivered over optical fiber, converted to DC on vehicle

Features:

- Immune to RF jamming and detection
- Automatically controlled to hold position
- Up to **1 KW** power, up to **1 km** range
- Electrically isolated & lightning resistant
- Lower weight than wire; enables higher altitudes
- Thinner cable reduces wind drag
- Flies in sustained **30 km/h** wind
- Payload (HD video, IR imaging/night vision, communications relay)



Current Status

- Power-over-fiber - TRL 7
- Earth power beaming - TRL 5

Wireless power beaming

- 3,000+ hours lab testing
- Demonstrated 100W laser beam to a small drone at 40m distance
- Automatic guidance and continuous flight

Power-over-fiber

- Commercially proven power supply system
- 3 systems are using for high-voltage digital instrument transformers

