Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

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Wireless Power Transmission

There are a number of circumstances where electricity is needed, but wired power delivery is not available, convenient, or technologically feasible. Remote industrial, scientific, and military endeavors often journey beyond established infrastructure, making wired power delivery more complicated, expensive, and dangerous. Also, emergency situations (e.g., natural disasters) can knock out power grids, causing damage in a matter of minutes that can take days or weeks to repair. That same damage can also limit access to the affected area by ground vehicles, particularly tankers and other traditional ground-based fuel transportation.

Wireless power transmission could solve many of these problems. Conventionally wireless power transmission currently uses electromagnetic (EM) radiation and typically in the far-field regime, where the transmission distance is much longer that the EM radiation wavelength. Because of the nature of the transmission, the efficiency of EM wireless power transmission falls off steeply with distance (e.g., ~2% at 1 km, and <1% at 10 km). This inefficiency is a problem compounded by the cost to implement such technology.

Researchers at Arizona State University have developed a method to wirelessly transmit power over long distances using one or more unmanned aerial vehicles (UAVs). Power can be converted at a source into a chemical fuel (e.g., hydrogen), delivered to a destination via a UAV, and reconverted to electricity at the destination. The UAVs can link directly with a load at a destination to transmit power, be in close proximity to the load and wirelessly transmit power, or drop off a power generating system and/or fuel source at the destination.

Potential Applications:

- Wireless power transmission to:
  - Remote locations
  - Protected areas
  - Construction sites
  - Mining operations
  - Overseas
- Wireless power transmission during emergency situations

Benefits and Advantages:

- Avoids use of far-field radiation
- Substantially increased range of delivering power wirelessly (e.g., up to and even over 1000 km)
- Increase in end-to-end efficiency (e.g., as efficient as ~50%)
- Implemented with minimal fixed infrastructure, permitting highly flexible operation and on-demand delivery
- Power levels from a few kW to many MW is feasible