

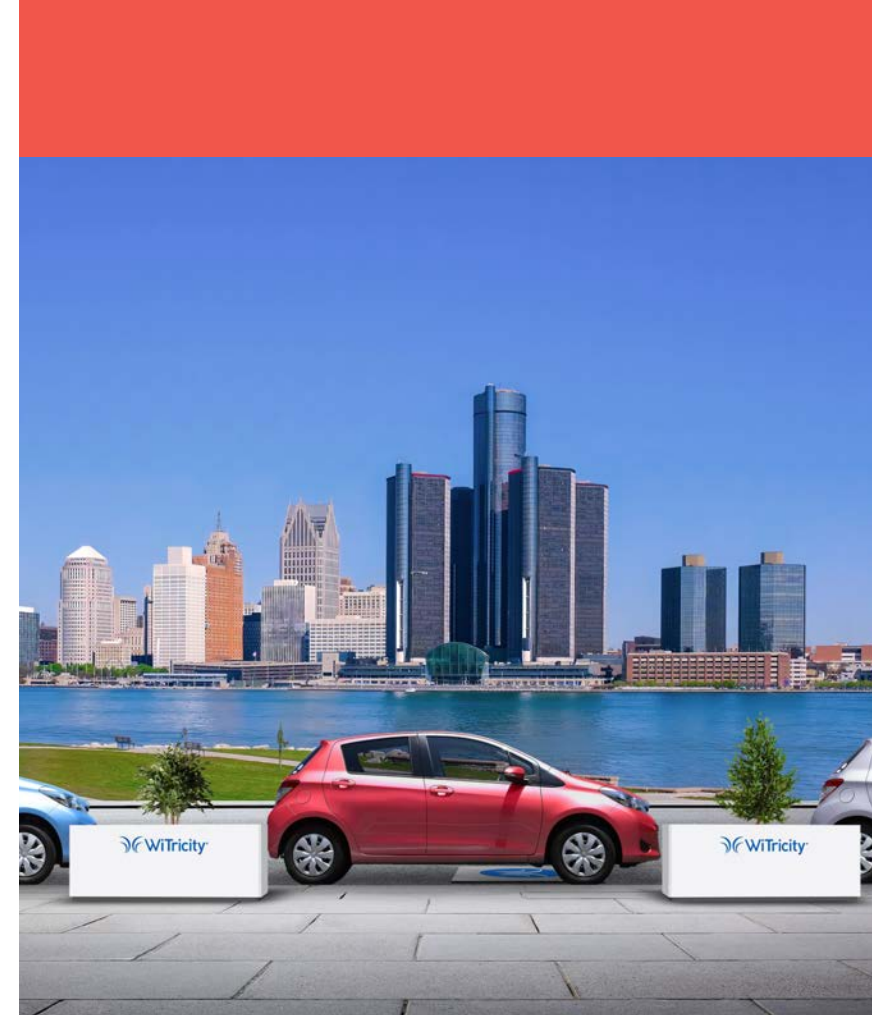
Wireless Charging

Alex Gruzen, CEO WiTricity

Thomas Wuerz, Head of Wireless Power Transfer, Siemens

Amy Barzdukas, CMO WiTricity

November 15, 2022



Charge Happy™

Agenda

1 Welcome and Introductions

4 Q&A

2 Overview – Alex Gruzen, WiTricity
CEO

3 Discussion on Wireless Charging –
Alex Gruzen and Thomas Wuerz,
Siemens



Meet WiTricity

- **The leader in bringing wireless EV charging solutions to the mainstream market**
 - > \$175 MM of capital raised
 - Driver and basis of key industry standards necessary for widespread adoption
 - Implemented at key automotive OEMs
 - Systems available starting in 2023
- **Established technology leadership**
 - Superior magnetic resonance technology
 - Full suite of automotive-grade software
 - Strong IP portfolio of 1,250+ patents
- **Market-ready solutions**
 - » Fleets and consumers
 - » On- and in-ground charging



US Government is Strongly Behind Wireless EV Charging

- **FY23 Appropriations**

- USG support and funding for EVs and related infrastructure remains a priority
- Significant dollars and opportunities for wireless EV infrastructure programs and dollars with robust, bipartisan support in both House & Senate

- **NDAA**

- Deputy Assistant Secretary of Defense for Environment and Energy Resilience must brief House Committee on Armed Services not later than February 1, 2023, on efforts to deploy wireless electric vehicle charging infrastructure at defense installations.
- Wireless EV charging achieved official definition within FY23 NDAA, via Representative Brenda Lawrence

- **Inflation Reduction Act**

- Strong positive outcomes from the Inflation Reduction Act – Passed in House and Senate
 - \$3 B for purchase of USPS zero-emission vehicles and requisite infrastructure purchase, design, and installation
 - High investment in EV tax credits → leads to more EV chargers in the future

- **Department of Transportation**

- Bipartisan Infrastructure Law allocates \$7.5 B for EV charging – wireless expected to play a key role in deployments



EV Charging Landscape



Level 2 Charging

Positives

- Most common method of charging
- Familiar to consumers

Negatives

- May require electrical work for installation
- Prone to component failure and vandalism
- Impacted by adverse weather conditions
- No single type of connector
- Inaccessible for disabled drivers

Use Cases

- Public charging stations
- Commercial (work) offices
- Home charging



Direct Current Fast Charging (DCFC)

Positives

- Fastest method of charging

Negatives

- Very expensive to install and to use
- Impractical for widespread adoption
- Very demanding on power grid
- Damages EV battery systems
- Same accessibility issues as L2 Charging for the disabled populace

Use Cases

- Highway corridors for distance travel
- Fleet charging for vehicles that require very high uptime



WiTricity Wireless EV Charging

Positives

- Easiest way to charge
- Versatility
- Greater reliability
- Increased accessibility
- Matched efficiency

Negatives

- Not yet widespread
- Initial cost
- Similar requirement for electrician as L2

Use Cases

- Home charging
- Public parking spaces
- Urban environments
- Fleet vehicle charging



Where Does Wireless Charging Fit in the EV Charging Landscape?

COMMUTERS



A red circular callout with the word "COMMUTERS" in white capital letters. To the right of the text is a small icon of a wireless charging pad. A thin red line extends from the bottom of the circle down to a bus stop shelter on a transit line in the background.

HOME



A red circular callout with the word "HOME" in white capital letters. To the right of the text is a small icon of a wireless charging pad. A thin red line extends from the bottom of the circle down to a suburban house in the foreground.

OFFICE



A red circular callout with the word "OFFICE" in white capital letters. To the right of the text is a small icon of a wireless charging pad. A thin red line extends from the bottom of the circle down to a modern office building in the background.

HIGHWAY



A red circular callout with the word "HIGHWAY" in white capital letters. To the right of the text is a small icon of a wireless charging pad. A thin red line extends from the bottom of the circle down to a highway interchange in the background.

MULTI FAMILY



A red circular callout with the words "MULTI FAMILY" in white capital letters. To the right of the text is a small icon of a wireless charging pad. A thin red line extends from the bottom of the circle down to a multi-story apartment building in the background.

URBAN



A red circular callout with the word "URBAN" in white capital letters. To the right of the text is a small icon of a wireless charging pad. A thin red line extends from the bottom of the circle down to a dense urban street scene in the background.



The Power of Magnetic Resonance

Power Transfer as Efficient as Conventional Plug-in

(90-93% grid to battery)

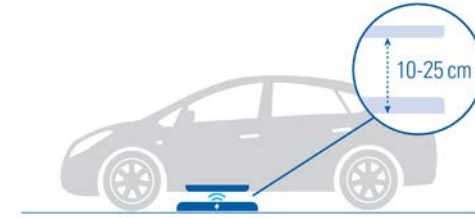


Powers Through Materials (In-ground placement)

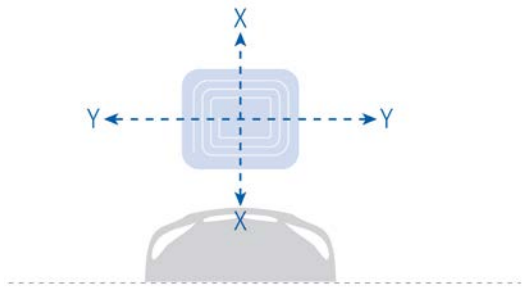
Asphalt, cement, snow, ice, etc.



Spans all Vehicle Heights with Single Design and No Moving Parts (Static or dynamic)

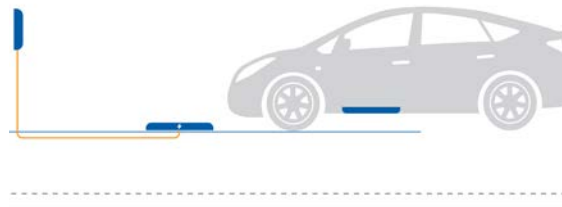


Park-and-Charge X-Y Flexibility



Charges as Fast as Conventional Plug-in

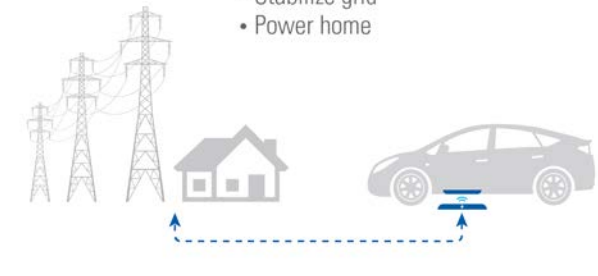
3.6 → 7.7 → 11 → 22 kW →



Bi-Directional Power Transfer

Use large battery on EV to:

- Stabilize grid
- Power home



WiTricity Driving Global Standards Development



Globally

SAE J2954

Published in October 2020

Global standards bodies ISO and IEC have aligned and will follow suit

SAE J2954/2

Currently in development for heavy duty vehicles



WiTricity: The Right Partner for the USG

- **First to market:**
 - » WiTricity is the first magnetic resonance wireless EV charging company to be ready for the mass market
- **Standards compliant:**
 - » In line with global standards for wireless charging with SAE, ISO, and vehicle OEMs
- **Staying power:**
 - » Well capitalized, backed by leading Tier 1 investors and strategic partners
- **Resources to modify systems to meet USG needs:**
 - » Charging system can span a wide variety of fleet vehicles
- **Durability:**
 - » Does not require the same level of maintenance as plug-in solutions
- **TRL 8:**
 - » ready for commercial production in 2023



Wireless EV Charging Use Cases

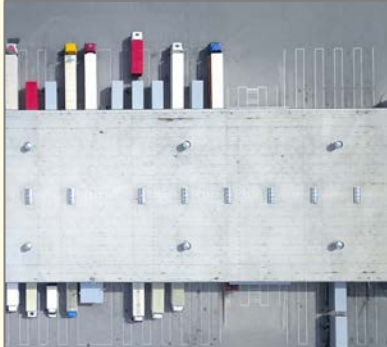
Commercial



Commercial Facilities



Urban Environments



Fleet Charging



ADA Access



Extreme Weather



Government



Government Installations



Municipal Fleet



USPS Fleet



Military Fleets



WiTricity Wireless EV Charging Use Cases

Degree of Importance

| WiTricity Benefit | Government Installations | Military Bases | USPS Fleet | Military Fleet |
|--|--------------------------|----------------|------------|----------------|
| Reduce Total Cost of Ownership | + | + | + | + |
| Multi-shift Operations | - | + | - | + |
| Multi-Vehicle Type Charging | + | + | + | + |
| Reduce Peak Demand Charges & Grid Strain | + | + | + | + |
| Future-Proofing | + | + | + | + |
| Disabled Access | + | + | - | - |

Government



Government Installations



Municipal Fleet



USPS Fleet



Military Fleets



Government Installations & Military Bases

- The Federal Government offers 49 different EV models – PHEV & BEV – across all vehicle types
 - » WiTricity offers a standardized approach to charging so any OEM vehicle can be compatible with charging infrastructure
- WiTricity Wireless EV charging can be implemented without the more costly grid upgrades required for DCFC



USPS Fleet

- The 2022 Inflation Reduction Act sets aside \$3 Billion for the purchase, design and infrastructure installation to support zero-emission Postal Service vehicles
 - WiTricity's wireless charging infrastructure can reduce costly demand charges
 - Wireless charging allows for dense-pack charging
 - Greater safety for drivers by eliminating trip hazards and drop damage

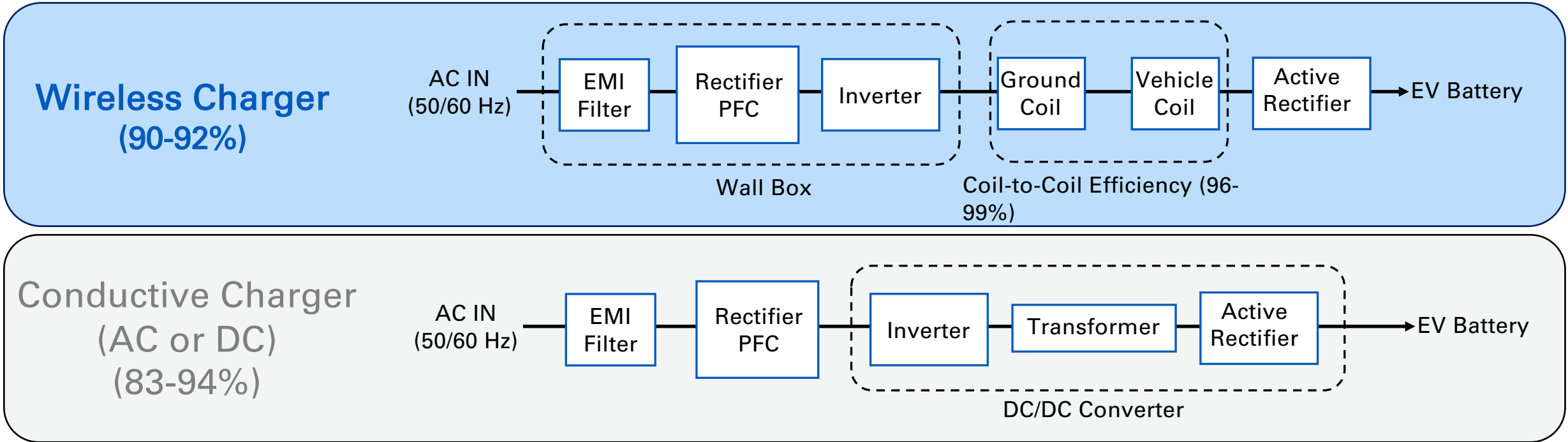


Military Fleets

- Electrifying military fleet vehicles will require strong, versatile wireless charging infrastructure
 - Heavy duty vehicles have bulky cords and cables that are difficult to wrangle, subject to drop damage
 - Eliminates opportunities for driver error remembering to plug in, unplug
 - Wireless charging requires less ongoing maintenance and inspection



Wired v. Wireless Charging: Efficiency



Wireless and conductive chargers have similar functional blocks

End-to-end efficiency is comparable for both type of charging

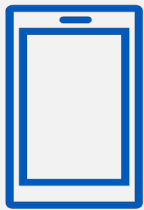


A Complete Solution



Hardened Automotive-Grade Software

- **Data, Cloud:** Cloud-based user session and vehicle data capture
- **Simulation Suite:** Full system modelling for design and performance analysis without prototyping
- **Applications Controller:** Ground-to-vehicle communication via WiFi and cloud connectivity via OCPP, MQTT and utility companies via ADR
- **Power Controller:** Dynamic tuning and power management with automatic efficiency optimization



Magically Simple Driver Experience

- **Mobile Application** for personalized experience
- **Position Detection:** Provides visual cues to driver for vehicle-to-ground pad alignment or positional data for auto-parking systems
- **Foreign Object & Living Object Detection:** Automatically shut off power if foreign objects (e.g. metal) or hands/feet enter charging area
- **Modern industrial design** in a compact, efficient form factor



Core Power Transfer: Patented Magnetic Resonance Technology

- **Magnetic near-field** used to transfer energy between resonant coils
- **Specially designed low-loss resonators** allow high efficiency
- **Proprietary tuning** technology enables efficient operation over a wide range of conditions
- **Compact and powerful** power electronics



Technology Roadmap

| | Today | Future |
|-----------------------------------|--|--|
| WiTricity Halo™ Wireless Chargers | <input checked="" type="checkbox"/> On ground | <input checked="" type="checkbox"/> In ground |
| | <input checked="" type="checkbox"/> Charging speed parity with L2 chargers for passenger vehicles and light trucks | <input checked="" type="checkbox"/> DCFC speed parity for heavy commercial vehicles |
| Vehicles | <input checked="" type="checkbox"/> Ready to engage to upfit existing electric fleets | <input checked="" type="checkbox"/> More EVs with wireless charging support from the factory |
| Software | <input checked="" type="checkbox"/> Asset control, mobile app, OCCP compliant | <input checked="" type="checkbox"/> Deeper integrations available |

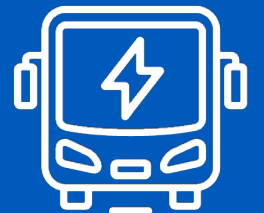
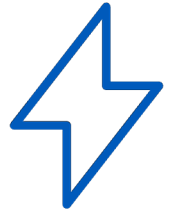


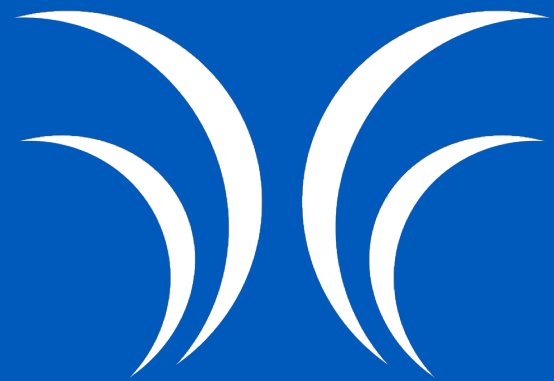
Summary

- Leader in wireless EV charging
- Strong technology suite and roadmap
- Aligned with USG goals for EV charging infrastructure
- Ability to tailor to USG needs
- Wide variety of USG use cases
- Global partnerships



Conversation





WiTricity®