Non-Tactical Vehicle Fleet Electrification

2019 Fall FUPWG Seminar

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“General Motors believes the future is all-electric… We are far along in our plan to lead the way to that future world.”

– **Mark Reuss, GM Head of Product Development**

GM Army TARDEC Chevy Colorado ZH2 fuel cell electric vehicle

“…expect to see more change in the auto industry in the next five years than we had in the last 50.”

– **Mary Barra, GM CEO**

Automotive Markets in Transition: ACES

Autonomous, Connected, Electric, and Shared

- **Economics: prices ↓ as competition ↑**
  - 85% ↓ in battery prices – 2010-2018
    2010: $1160/kWh → 2018: $176/kWh → 2021: ~$100/kWh
  - Li-ion manufacturing capacity ↑
    2019: 316GWh/yr → 2025: >1090GWh/yr
- **Technology: maturing**
  - 5-7% ↑ in battery energy density annually
  - EV sedan: ~115+ MPGGE - ICE sedan: ~30 MPG

- **Policy: ↑ fuel economy and emissions requirements globally are pushing OEMs to electrify to remain competitive**
  - All vehicle OEMs have electrification plans in near-term
  - Dieselgate fallout; ZEV / LEV mandates increasing
- **Interoperability b/w EVSE (charging stations) companies; oil & gas acqs**
  - ChargePoint and Electrify America partnership - 2019
  - Shell purchased Greenlots EVSE Network - 2019
  - BP invests heavily in FreeWire (2018) and PowerShare (2019)
  - GM partnership w/ ChargePoint, EVgo, Greenlots - 2019

Electric Vehicle Supply Equipment (EVSE)

Level I – 120 volt AC
- ~5 miles of range/hr
- $

Level II – 240 volt AC
- up to ~70 miles of range/hr, but ~25 more common
- $$

DC Fast Charge – typically 480 volt AC three-phase input
- ~40 miles of range / 10 minutes
- $$$

Updated EVSE Criteria: UFGS 11 11 37

- **Multi-agency criteria revision effort**
  - Published on WBDG DEC 2018
  - Provides much needed DoD reference for EVSE installs

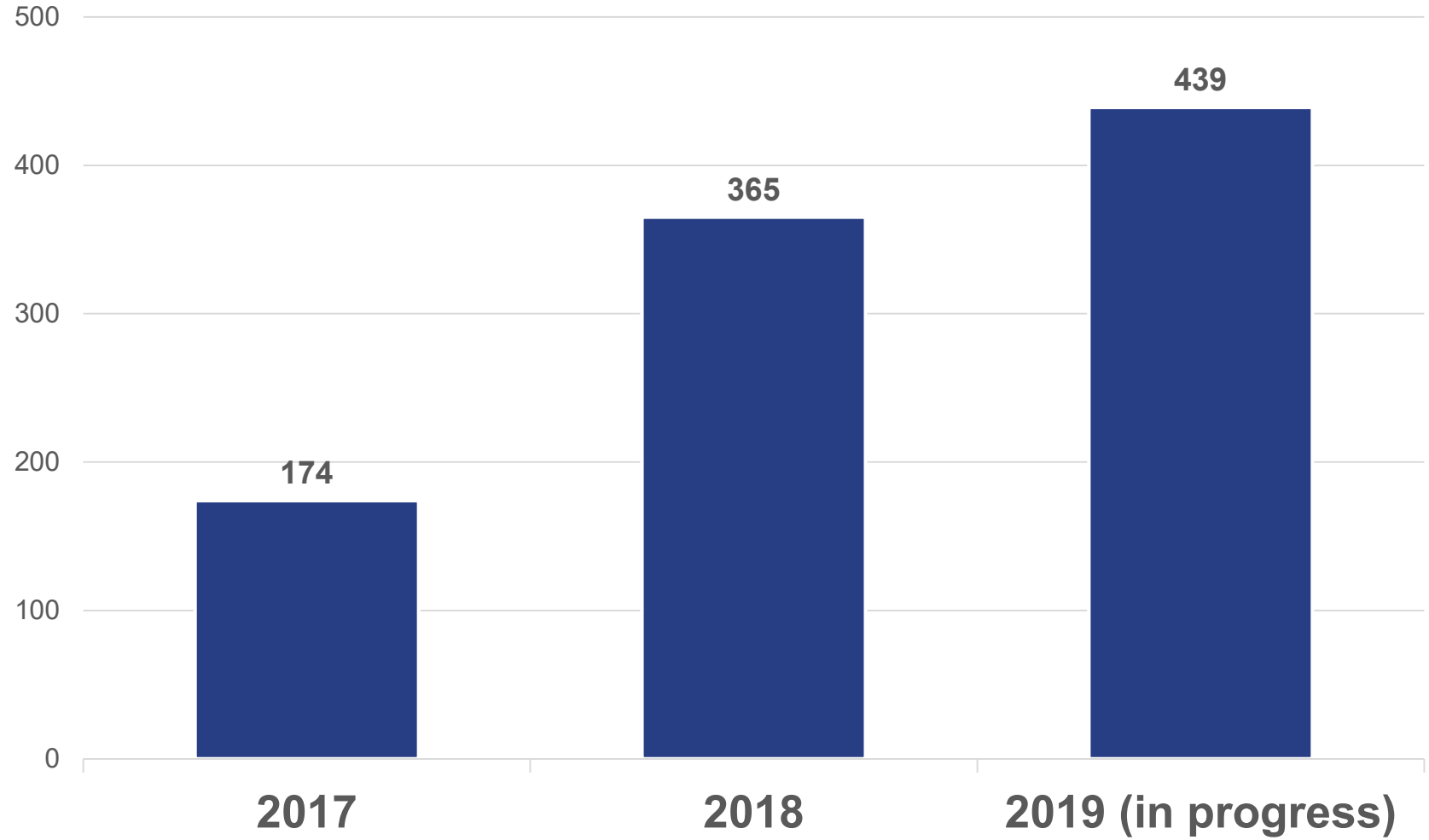
EVSE Equipment Selection and Procurement

- **GSA BPA for EVSE: www.gsa.gov/EVSE**
  - Pre-competed, streamlined procurement process
  - Provides uniform EVSE installs across enterprise since project teams are selecting from limited equipment list
  - NAVFAC standard EVSE configuration:
    - Dual port Level 2 w/cellular connection
    - CLINs 11A or 15A

Navy Workplace Charging Policy

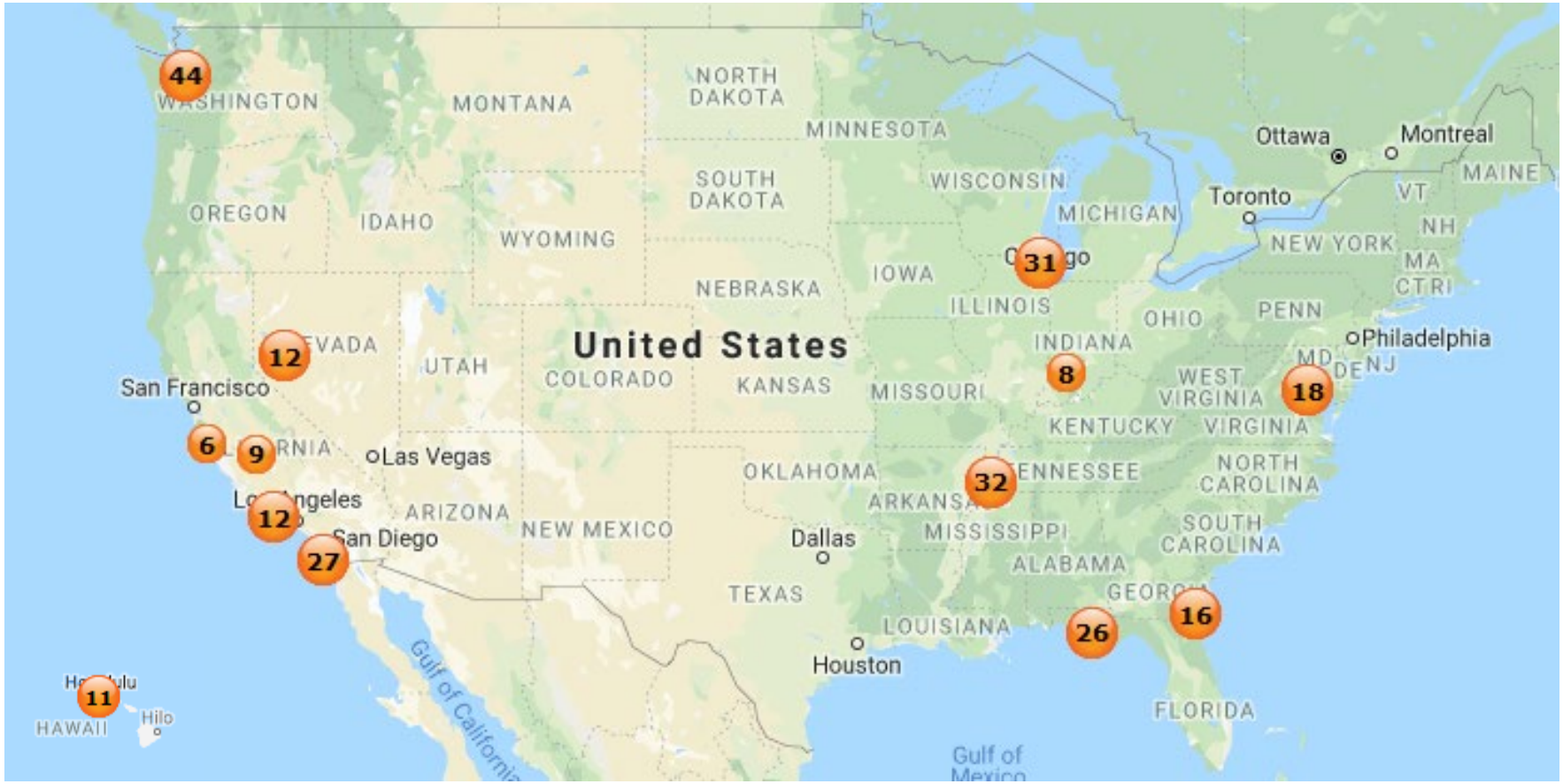
- **CNIC Instruction on Personnel Workplace Charging for EVs**
  - Released summer 2019
  - Employees must pay for EVSE use in accordance with FAST Act and CEQ implementation guidance → Pay.gov or payroll deduction
  - Navy Regions currently identifying installations for pilots
    - Focus on opportunities to use existing EVSE for employee charging where feasible
    - Additional EV infrastructure will be needed across the enterprise to meaningfully support employee EV charging - Level 1 in employee parking lots

EVSE Port Totals Across NAVFAC



Level 2 and DC Fast Charger ports only; dedicated NAVFAC Level 1 EVSE number over 600 (primarily for EV golf carts)

Limited Distribution of Charging Stations

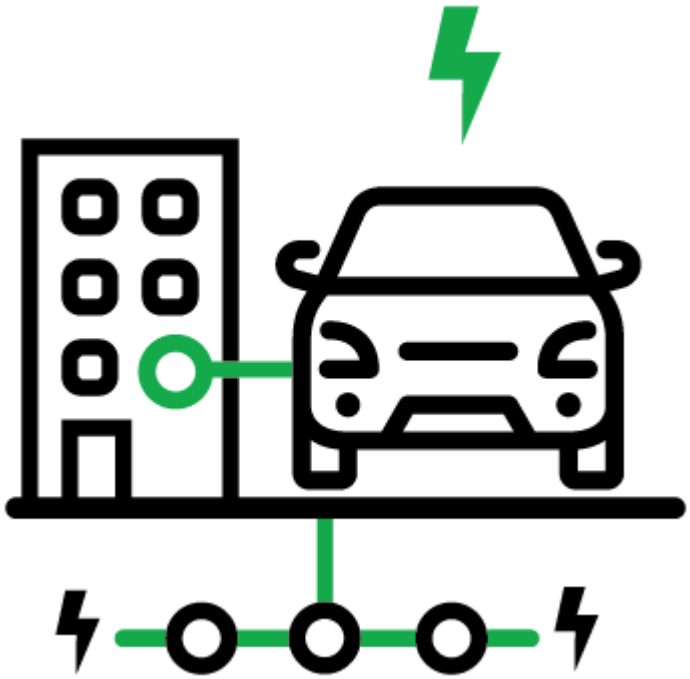


NAVFAC's ChargePoint EVSE as of 30 SEP 2019. Not comprehensive.

Grid-Independent EVSE Solution

- **EV ARC™ mobile solar-powered EVSE / emergency power supply**
  - Naval Base San Diego

Next Steps



- Complete installation of planned EV infrastructure at bases where design work is complete
- Optimize fleet profile to electrify additional administrative vehicles as leases come up for renewal
- Maximize utilization of existing EVSE
  - Use dynamic fleet management to break away from 1:1 EV-to-charging-port ratio
- Explore opportunities for vehicle-grid integration (VGI) where appropriate for smart grid demand response capability

Questions?

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