Evolving Ground Mobility at Airports

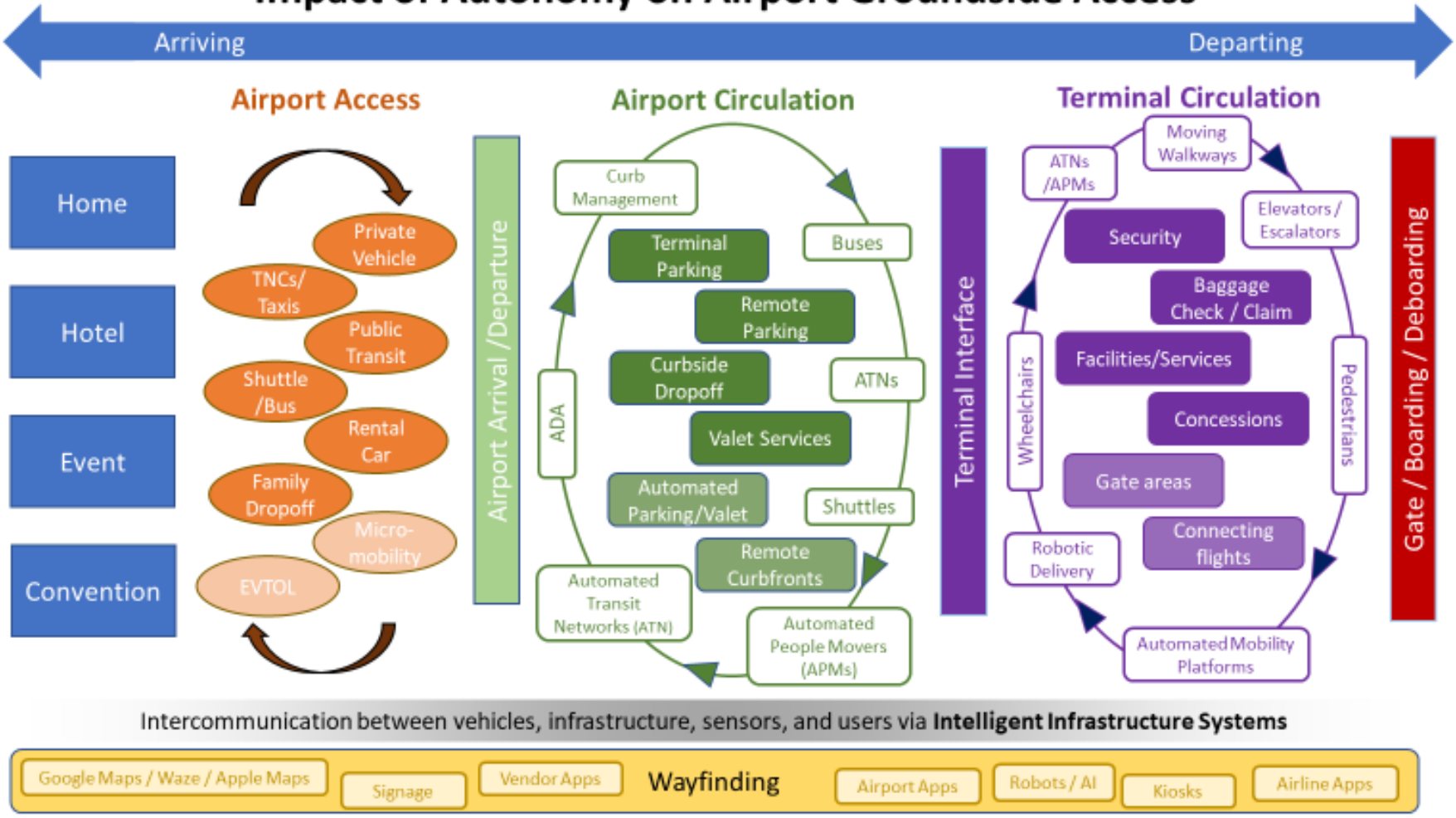
Andy Duvall

Photo from iStock 1170300735

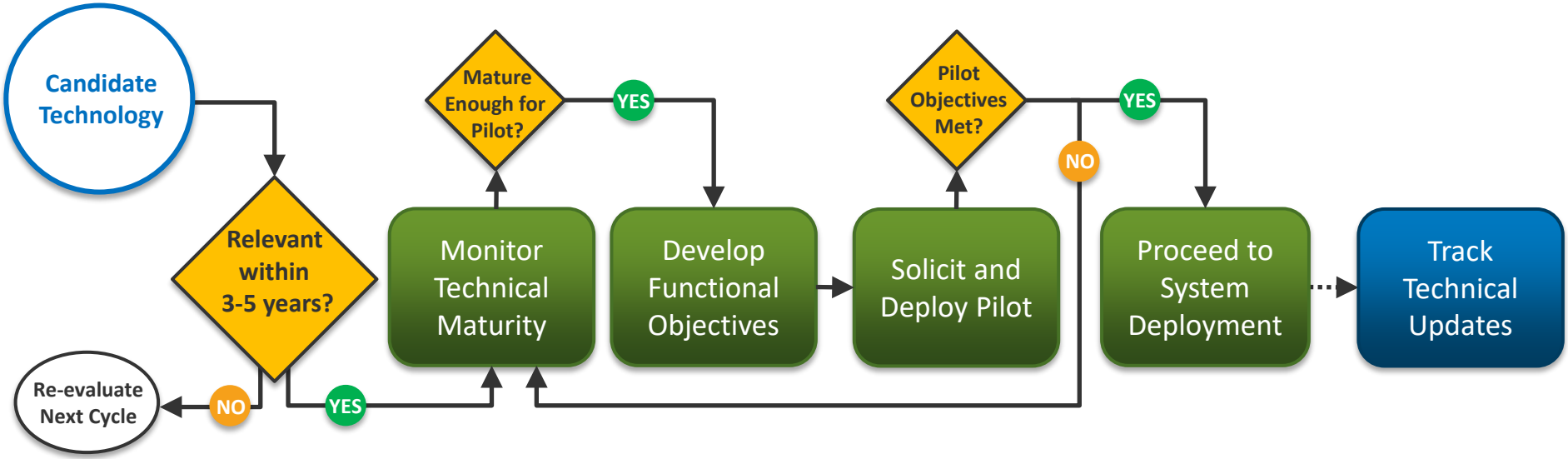
Why Focus on Airports?

- **An airport is a core mobility hub for a region**
  - For both air and *ground* mobility
  - Major employer and commerce site
  - Travel and distribution operations
  - Large parking/vehicle/land reserves
- **New mobility technologies** often first appear and are refined at airports
- **Emphasis areas:**
  - Mobility automation for access and circulation
  - Traveler and employee perspectives
  - Synergy of automation and electrification

Impact of Autonomy on Airport Groundside Access

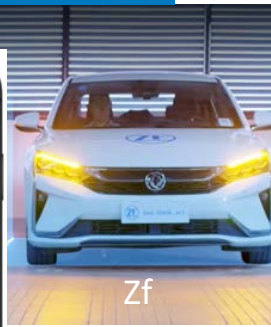


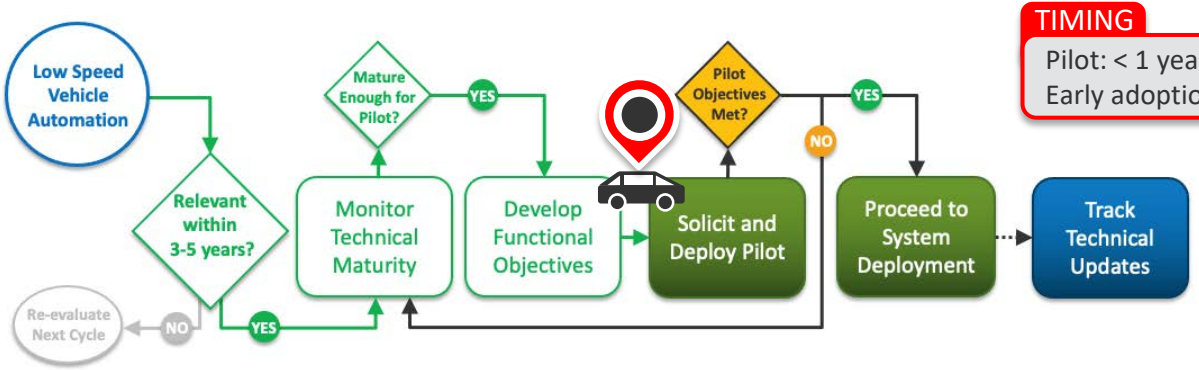
Airport Innovation Decision Process



Technology Pathway: Automated Parking

- **Level of Maturity:** Early production available
- **Functional Objectives:** Automated parking and summon features; enables re-envision of curb, parking resources
- **Pilot:** Auto-valet demonstration for vehicle automation, supervisory parking system, and active curb management
- **Dependencies / Synergies:**
  - Intelligent infrastructure system
  - EV technology for either inductive or robotic charging





TIMING

Pilot: < 1 year
Early adoption: < 5 years

Technology Pathway: Landside People Mover

- **Level of Maturity:** Initial demonstrations; Waymo One is in operation (*definitely worth a visit*)
- **Functional Objectives:** Non-secure side traveler and employee movement without dedicated guideways
- **Pilot:** Limited deployments (except Waymo)
- **Dependencies / Synergies:**
  - Intelligent infrastructure system
  - EV technology for inductive charging
  - Wayfinding platform

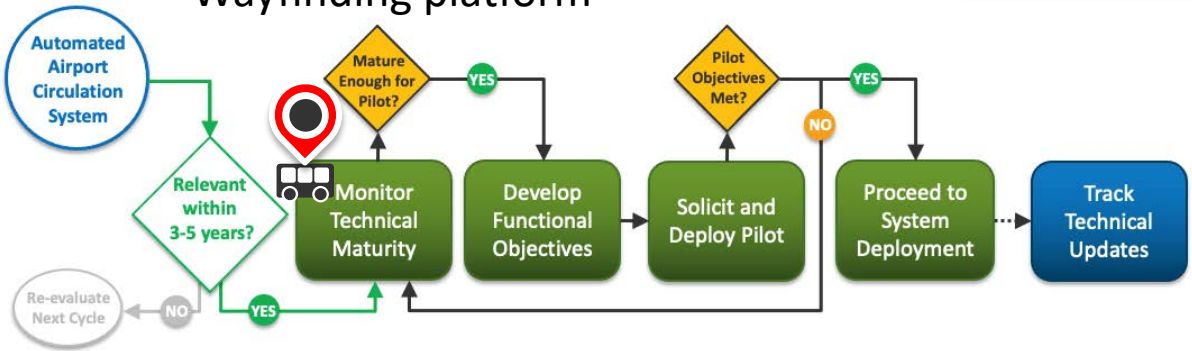

Masdar 2Getthere - 2010

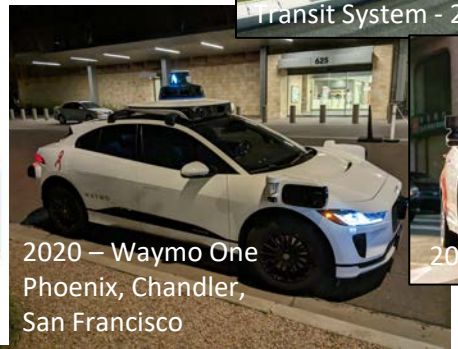

Heathrow Ultra - 2011


Toyota - Intelligent Multimodal Transit System - 2005

TIMING

Pilot: Now to 3+ years
Deployment: Now to 5+ years




2020 – Waymo One
Phoenix, Chandler,
San Francisco

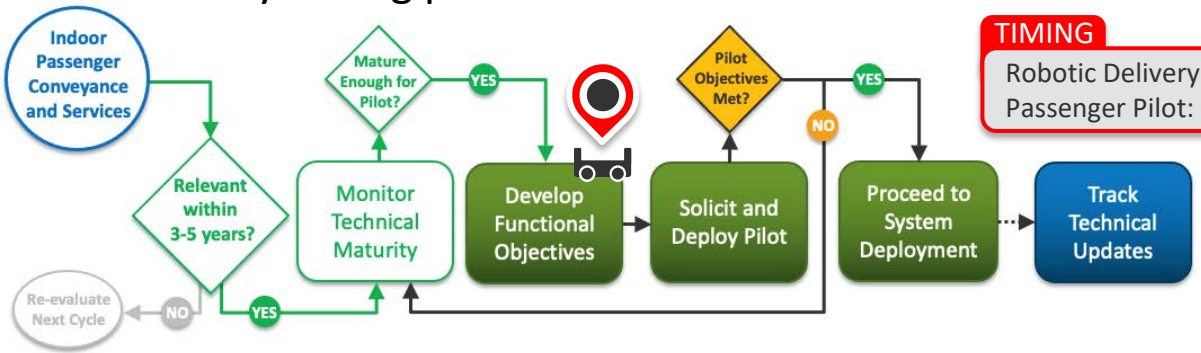

2021 – Cruise - GM

Technology Pathway: Automated Terminal Movement

- **Level of Maturity:** Robotic delivery is viable; passenger options developing
- **Functional Objectives:** Robotic delivery in terminals, automated mobility platforms (AMPs) augment moving walkways & golf carts to distant gates
- **Pilot:** Robotic delivery mature. Passenger service emerging.
- **Dependencies / Synergies:**
  - Intelligent infrastructure system
  - Wayfinding platform

IMAGE: YOUTUBE/PORT OF SEATTLE


Images: NREL



TIMING

Robotic Delivery Pilot: Ready
Passenger Pilot: < 3 years

Sidebar: A Facility-Scale Automated Mobility System

- **Problem/Objective:**

When someone enters a large facility such as airport, university building, large healthcare complex they immediately fall into a transportation gap. This is especially true for the elderly, obese and anyone living with a disability, or injury that prevents them from being able to self ambulate. As facilities increase in size this impacts more travelers, decreases efficiency, creates inequities.

- **Facility automated systems address:**
  - Long wait times
  - Customer frustration / way-finding
  - Energy and mobility inefficiencies
  - Equity for People with Reduced Mobility

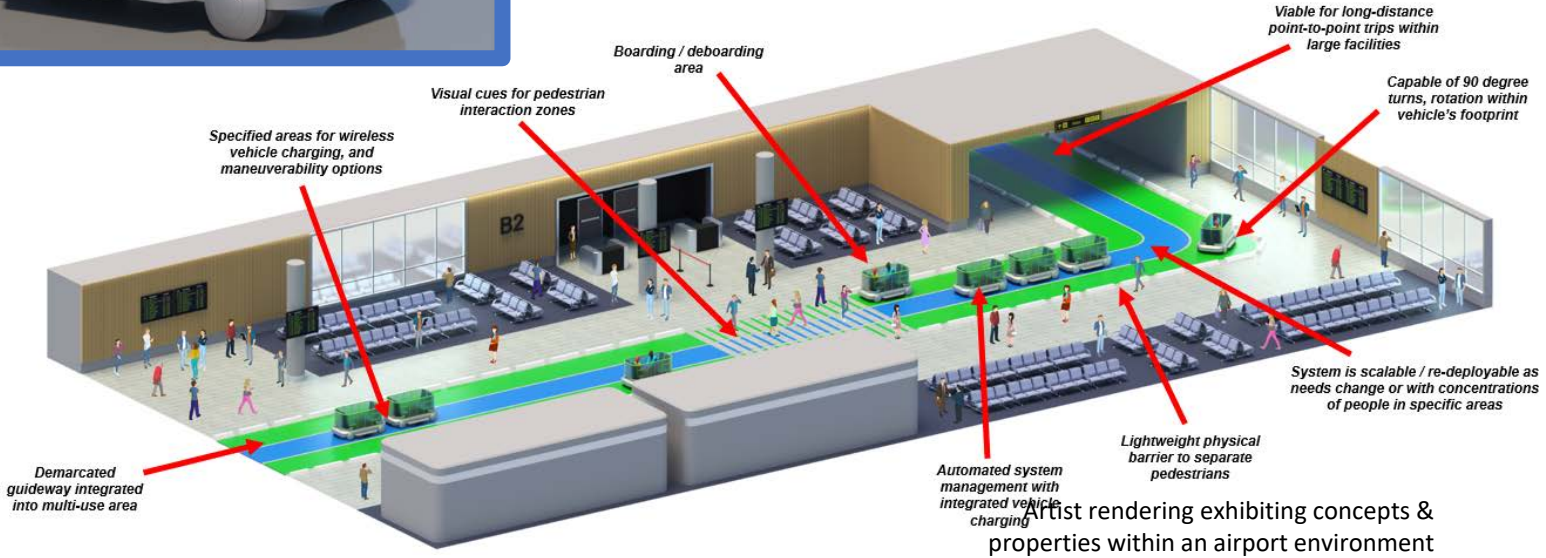
Sidebar: A Facility-Scale Automated Mobility System

Automated Mobility Platforms (AMPs)

STTR between Luci & NREL – 2022/23

LUCI turns dumb, dangerous power wheelchairs into smart ones:

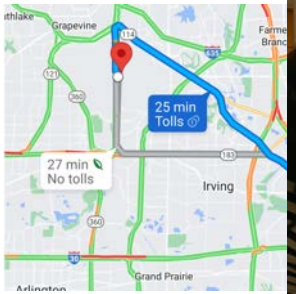
- *LUCI Is intervening more than 11,000 times – every week*
- *LUCI units in 40 states and growing*
- *22 patents on award winning technology*

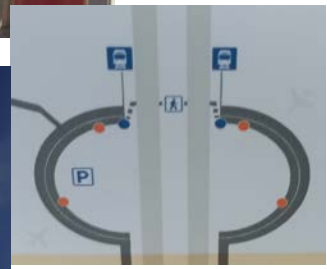


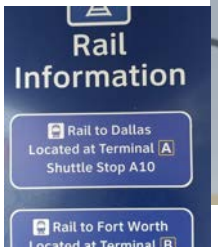
Artist rendering exhibiting concepts & properties within an airport environment

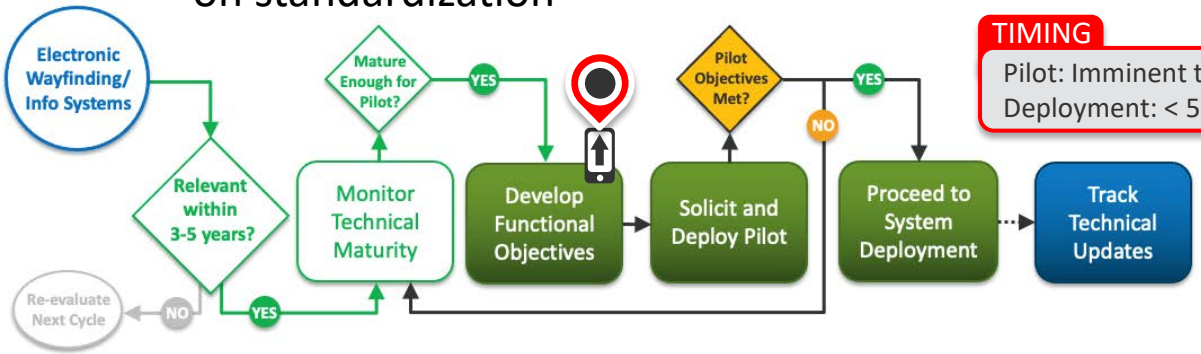
Technology Pathway: Wayfinding/Info Systems

- **Level of Maturity:** Large mapping services in development
- **Functional Objectives:** Standardized interfaces; authoritative info from airport is critical
- **Pilot:** Imminent deployment
- **Dependencies / Synergies:**
  - Standardized indoor geolocation
  - Policy for information sharing with stakeholders
  - Airport consortium collaborative approach with emphasis on standardization







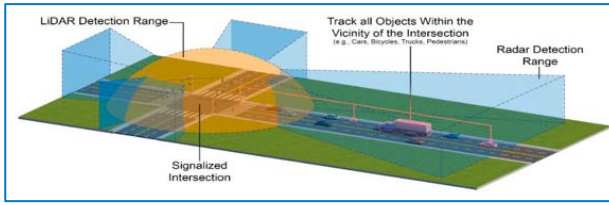


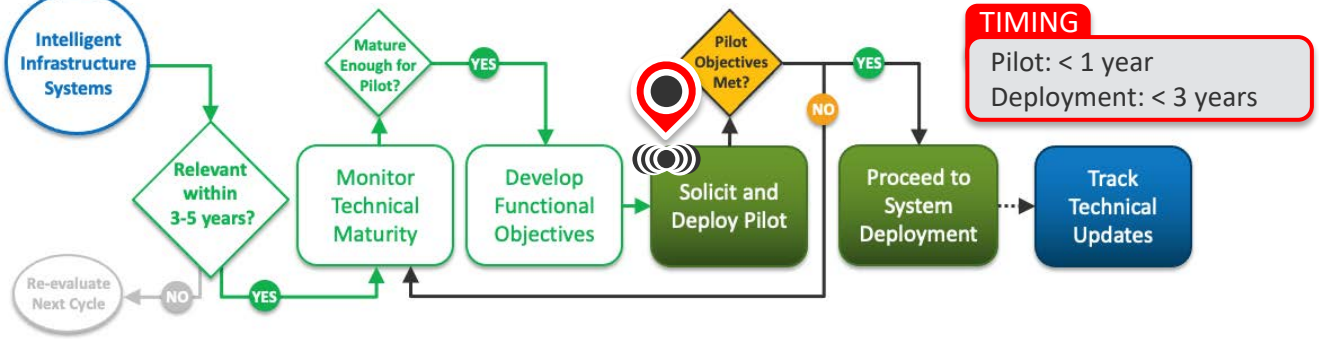
TIMING

Pilot: Imminent to < 2 years
Deployment: < 5 years

Technology Pathway: Intelligent Infrastructure Systems

- **Level of Maturity:** Active development, coordination with traffic management systems
- **Functional Objectives:** Perceive, track and identify moving objects; monitor occupancy, inflow, outflow, and curb-side operations; convey info to operations center.
- **Pilot:** Multiple relevant demonstrations
- **Dependencies / Synergies:**
  - Light duty vehicle automation
  - Wayfinding data collection, dissemination and management





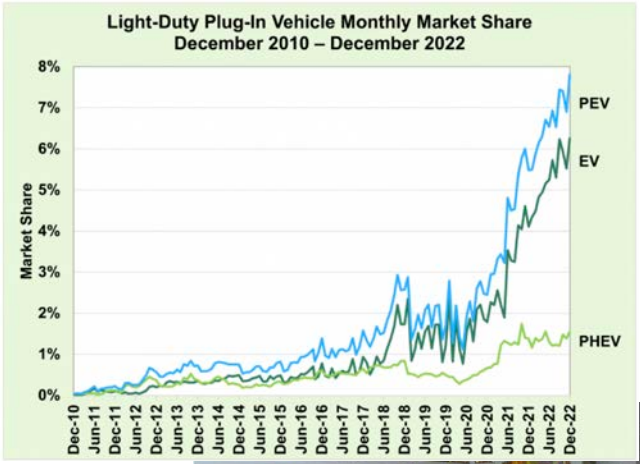
TIMING

Pilot: < 1 year
Deployment: < 3 years

Technology Pathway: Adoption of Electrified Transportation

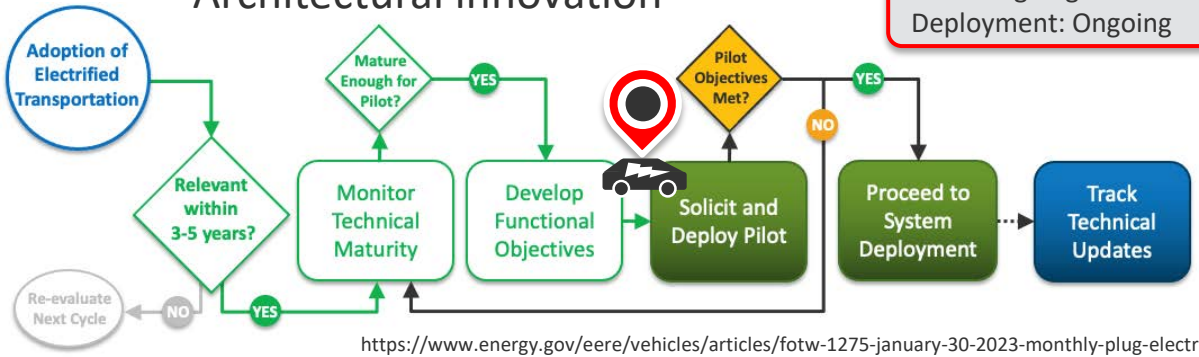
- **Level of Maturity:** PEVs sales surpassed takeoff stage, at ~8% of new light duty vehicle sales as of December 2022
- **Functional Objectives:** Building/grid/PV integration, V2X, resilience strategies; rental car facilities initial focal point
- **Pilot:** Several airports are pursuing electrification
- **Dependencies / Synergies:**
  - Light duty vehicle automation
  - Energy resilience planning
  - Architectural innovation

CREDIT: TECH TIMES - Paul Hennessy/NurPhoto via Getty Images



TIMING

Pilot: Ongoing
Deployment: Ongoing



https://www.energy.gov/eere/vehicles/articles/fotw-1275-january-30-2023-monthly-plug-electric-vehicle-sales-united-states

Framing the Conversation

- What are key items from airport ground mobility deployments that can inform broader implementation?
- How can NREL/DOE support planning and evaluation of mobility deployment projects?
- For operators (airports, cities, car rental and other vendors), what are the biggest needs to overcome barriers to technology adoption?

Thank You

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NREL/PR-5400-86422

This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Vehicle Technologies Office. The views expressed in the article do not necessarily represent the views of the DOE or the U.S. Government. The U.S. Government retains and the publisher, by accepting the article for publication, acknowledges that the U.S. Government retains a nonexclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work, or allow others to do so, for U.S. Government purposes.