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Energy Intelligence, Realized.

Impact of Electric Vehicles Discussion

Missouri Public Service Commission, Jefferson City MO
Brian Bradford, Market Strategy
June 28, 2010

Agenda

- GridPoint Overview

- Vehicle Impacts

- Approaches to Charging Management

- What Utilities Need to be ready
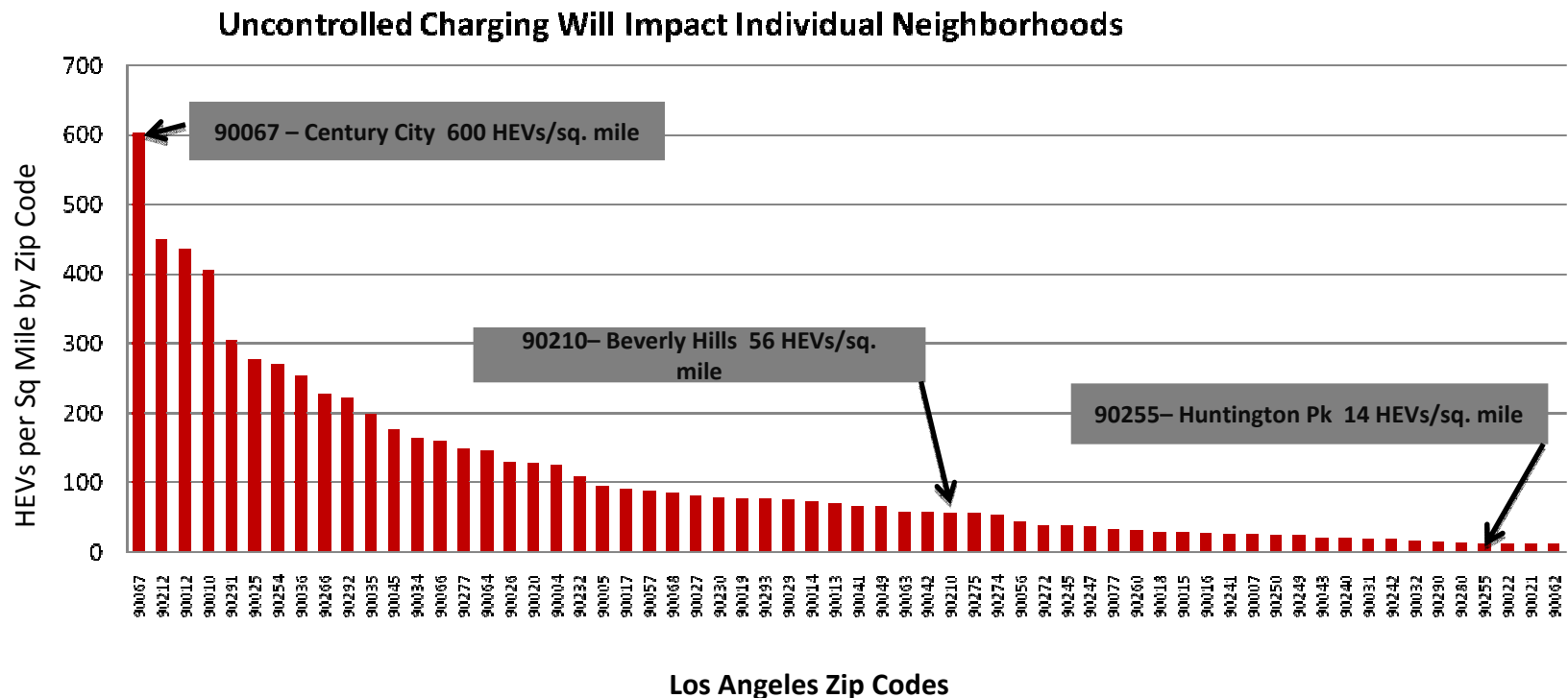
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Gridpoint Overview

- Leader in smart energy solutions for utilities, businesses, and consumers

- Smart grid pioneer, delivering software to aggregate and manage distributed load, storage, and generation

- Proven smart charging experience:
  - 300+ plug-in vehicles currently grid-aware via GridPoint technology
  - Integrated with level 1-3 charging infrastructure

- Leading utility customers

Xcel Energy	Duke Energy	Puget Sound Energy
Seattle City Light	ConEd	Austin Energy
Progress Energy	BC Hydro	Com Ed
Baltimore Gas & Electric	Reliant Energy	KCP&L

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Electric Transportation is Arriving Soon

Over

70%

of auto makers*
are introducing
plug-in vehicles

*by market share

Grid Impact Will Be Localized

- Density of adoption will vary significantly within a single utility grid
- Distribution-level impact long before system-level impact
- Clustered adoption requires location-based charging management

Uncontrolled Charging Will Impact Individual Neighborhoods

90067 – Century City 600 HEVs/sq. mile

90210– Beverly Hills 56 HEVs/sq. mile

90255– Huntington Pk 14 HEVs/sq. mile

HEVs per Sq Mile by Zip Code

Los Angeles Zip Codes

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Preparing the Grid for Plug-in Vehicles

- **Utility managed charging behavior is essential**
  - **Smart Charging** – managing the timing and pace of the energy flowing to plug-in vehicles
  - **Vehicle-to-Grid (V2G)** – managing the bi-directional flow of energy, when necessary flowing energy back to the grid

- **Charging management delivers significant value**
  - **Load** – adaptively controlled in response to demand
  - **Storage** – mobile batteries offering energy storage options
  - **Generation** – in time, vehicles will be able to return energy to the grid

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Approaches to Charging Management

- **Do Nothing.** Allow energy to flow whenever a driver plug into the grid

- **Time Based.** Timer mechanism restricts charging to certain times of day

- **Price Based.** Automated charging control starts or stops based on utility price signals and driver-programmed limits using Time of Use (TOU) pricing

- **Smart Charging.** Sophisticated software algorithms balance driver needs with real-time grid conditions to shape load

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With Charging Control in Place Utilities Win

- Shift new charging load out of peak periods
- Shape charging load to maximize financial and environmental benefits
- Dispatch vehicle load to increase use of renewable energy
- Gain access to a new, low cost source of energy storage
- Respond to grid emergencies
- Manage charging behavior

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Engaging Vehicle Owners Will Be Critical

- Plug-in vehicles have a primary purpose: **transportation**

- For utilities to leverage vehicles for grid management, access to a significant number of vehicles will be required

- To be effective, utilities will need to:
  - **Educate** their customers more than ever before
  - **Create incentives, financial or otherwise,** for vehicle owners to enroll in smart charging programs
  - **Prove the ability to balance** a vehicle owner's needs for "electric fuel" with their own desire to manage vehicle charging

  - **Manage** infrastructure and impact to the grid

What We Need to Be Ready

- A system that:

  - Meets near-term **distribution challenges and consumer needs**

  - **Minimizes grid impact** and **maximizes the opportunity** of plug-ins

- Load-shaping capabilities that enable meeting **location-specific dispatch** demands and **peak avoidance** requirements

- **Engagement of vehicle owners,** requiring innovative incentives and rates that include a level of charging guarantees

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