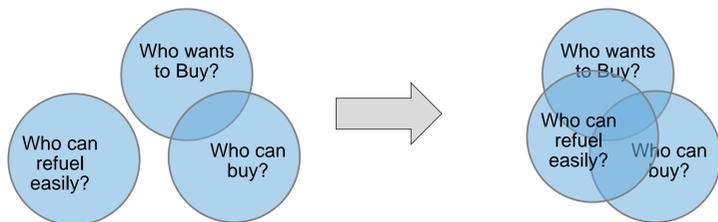


## Introduction

This project, is meant to explore the role of hydrogen station placement on the purchase decision. Stations that attract new buyers may not actually be the stations that customers use after purchase. Use of hydrogen is relatively well established as following a flow-capture paradigm, but the influence of placement on purchase is less well understood. Is there an opportunity to combine the paradigm where fuel is both on the way to a common destination and close to home? This possibility is explored.

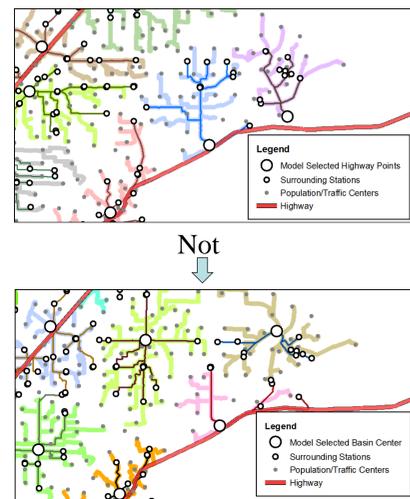
## Demand for Hydrogen Vehicles



<b>Who wants to Buy?</b>	People with higher education	Hybrid owners	Looking for a new vehicle
<b>Who can buy?</b>	Higher income	2nd car in the HH	Travel patterns
<b>Who can refuel easily?</b>	Station close to home	Stations close to frequent routes	Stations close to desired destinations

## Background

Flow capture as a valid way to estimate refueling demand from gasoline (Nicholas 2010) and for CNG (Kelly and Kuby) is fairly well established.



Figs.1,2 Gasoline volume data matches a path dependent paradigm (Nicholas)

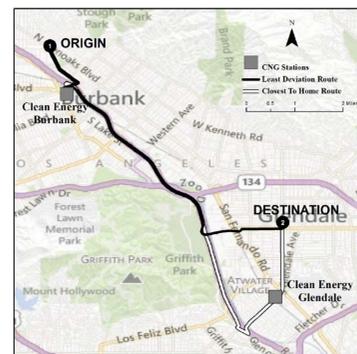


Fig.3 Origin is work. Refuel CNG on least deviation path even though there is a station nearer to home (Kelly and Kuby)

## How Pivotal is a Home Station?

- The weekend refueling problem... What role does it play?
- What effect does this have on the sizing and siting of stations?
- Can we solve the weekend refueling problem independent of the usage? Ie broad general coverage with little use case. A few “least deviation” stations to handle the majority of usage.
- Can we address both issues simultaneously?

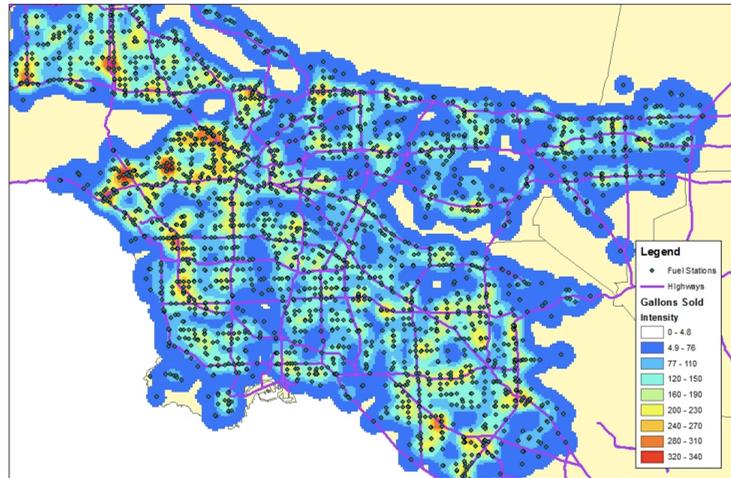


Fig.4 Gasoline fuel distribution in Los Angeles

## Proposed Decision Framework

- A latent market exists for H2 vehicles without infrastructure or vehicles
- Ease of refueling increases the likelihood of a fuel cell vehicle purchase
- Frequent or “Anchor” station is a prerequisite for vehicle purchase
  - Anchor station is more attractive the closer it is to home along a frequent travel path
- Wider availability or “Network” stations (connector and destination stations) increase the attractiveness of a fuel cell vehicle
  - Attractiveness is related to frequency of passing a station (regional)
  - Attractiveness is related to ability to expand what's possible (aspirational)
- Other factors such as vehicle price, H2 price affect desirability

## Market Locations May Emulate EVs

- CEC funded the GIS EV planning toolbox for MPOs can be used for hydrogen with some modification
- Based of spatial surveys of EV drivers about purchase and recharging
- 3 Modules: Market, Workplace and Fast Charging
- Market model examines the characteristics of current buyers from surveys. Creates a spatial distribution of future demand based on census variables.
- Depends on the Caltrans Statewide Travel Survey including long distance trips

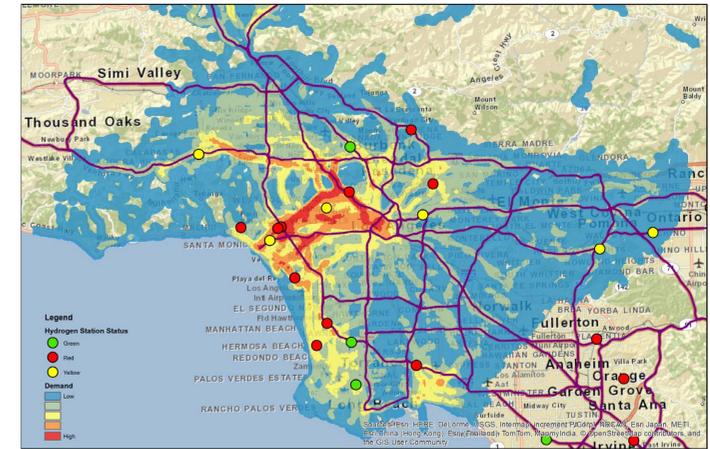


Fig.5 First five mile demand from EV owner distribution (shortest path, fastest path will be done later)

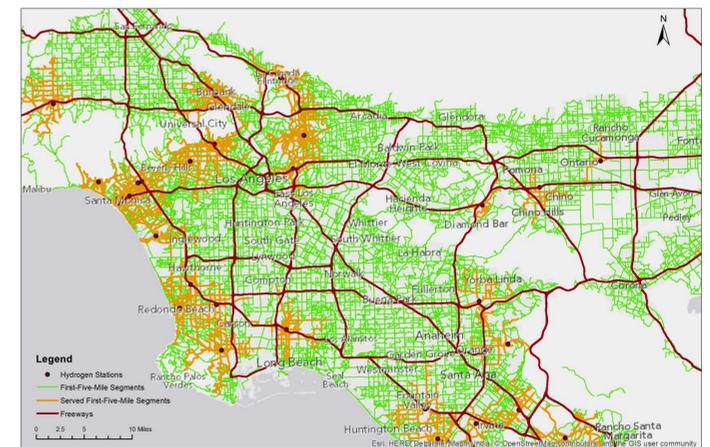


Fig.6 Demand served at some station within the first five miles of a commute trip



Fig.7 Long distance demand scaled to EV owners and location where a 300 mile vehicle would need fuel

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