Geographically Based Hydrogen Demand & Infrastructure Analysis

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Project ID # AN06

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Overview

Timeline

Project start: October 2004

Project end: September 2006

Percent complete: 75%

Budget

Total Funding: $380K

FY 2005 Funding: $200K

FY 2006 Funding: $180K

Barriers

Hydrogen Storage A
Lack of a hydrogen/carrier and infrastructure options analysis

Tech Validation C
Hydrogen refueling infrastructure

Systems Analysis E
Lack of understanding of the transition to a hydrogen-based economy

Collaborators

UC Davis, ORNL, Arizona State University

Objectives

FY 2006

- Quantify hydrogen demand in the U.S.
- Estimate costs to support infrastructure to meet emerging hydrogen demand.

FY 2005

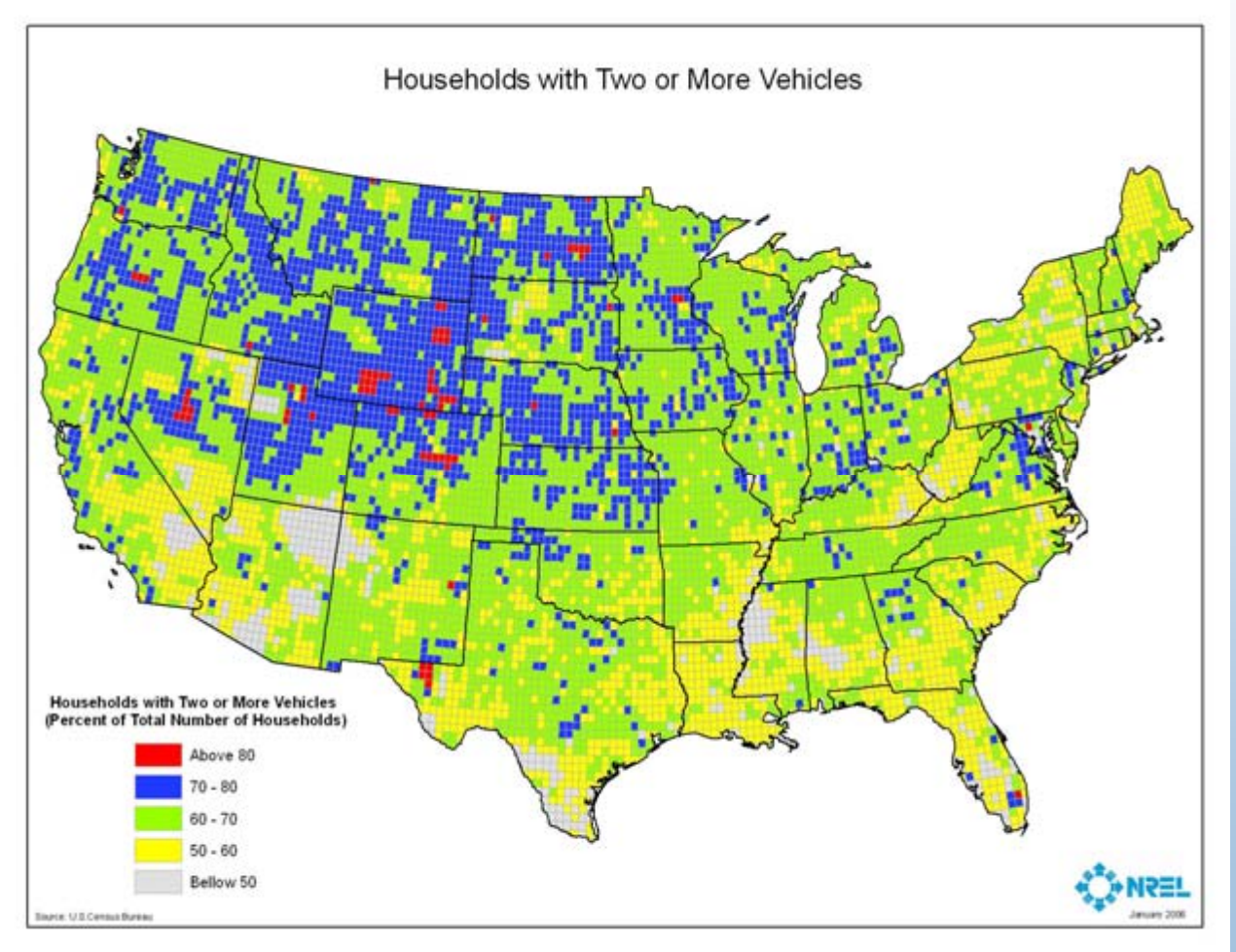
- Quantify and location a minimal interstate based hydrogen infrastructure

Approach

- Identify key demographic attributes affecting hydrogen vehicle adoption
- Prioritize attributes
- Evaluate scenarios
- Define infrastructure scenarios at various penetration rates
- Identify costs and potential for stranded assets

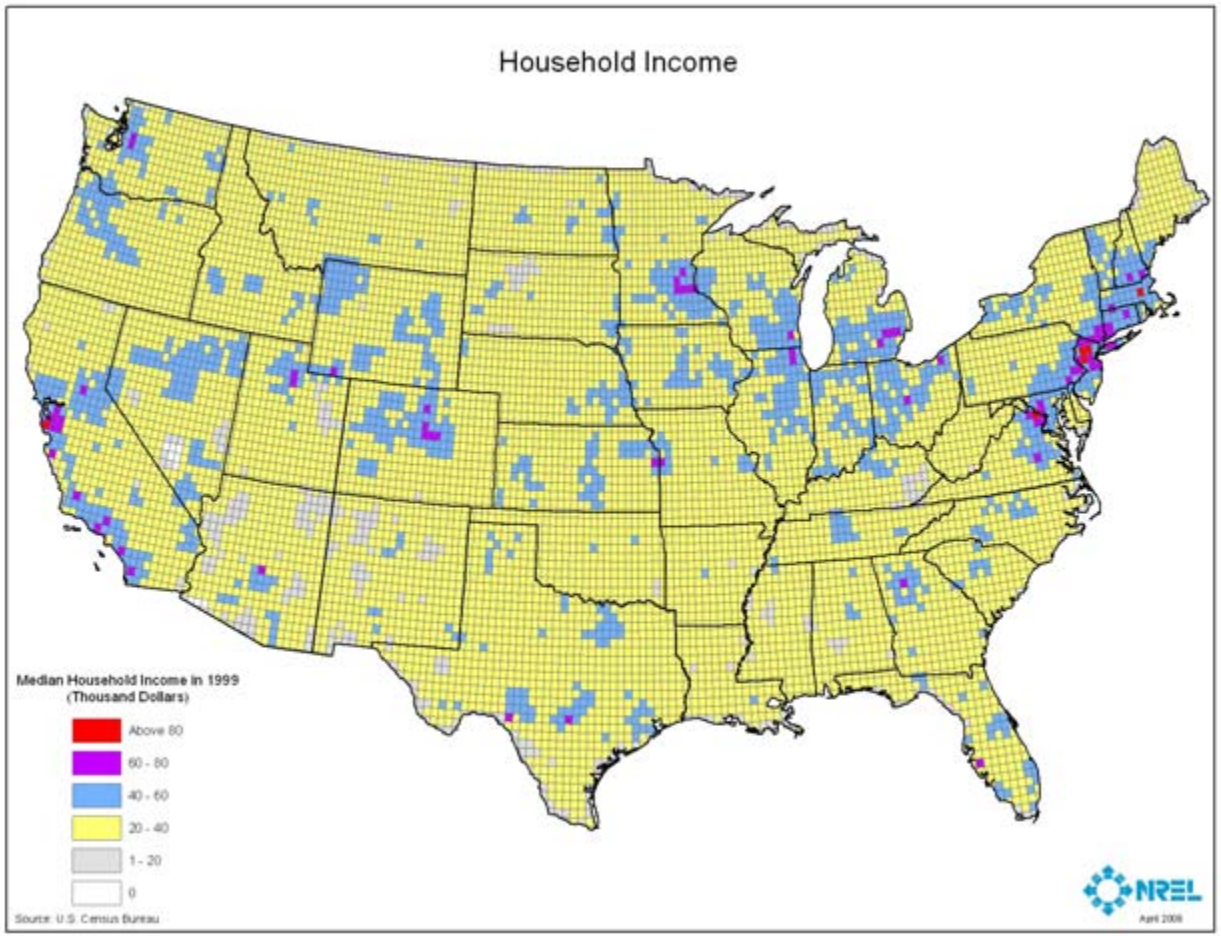
Hydrogen Analysis Diagram

Identify Key Demographic Attributes Affecting Hydrogen Vehicle Adoption by Consumers



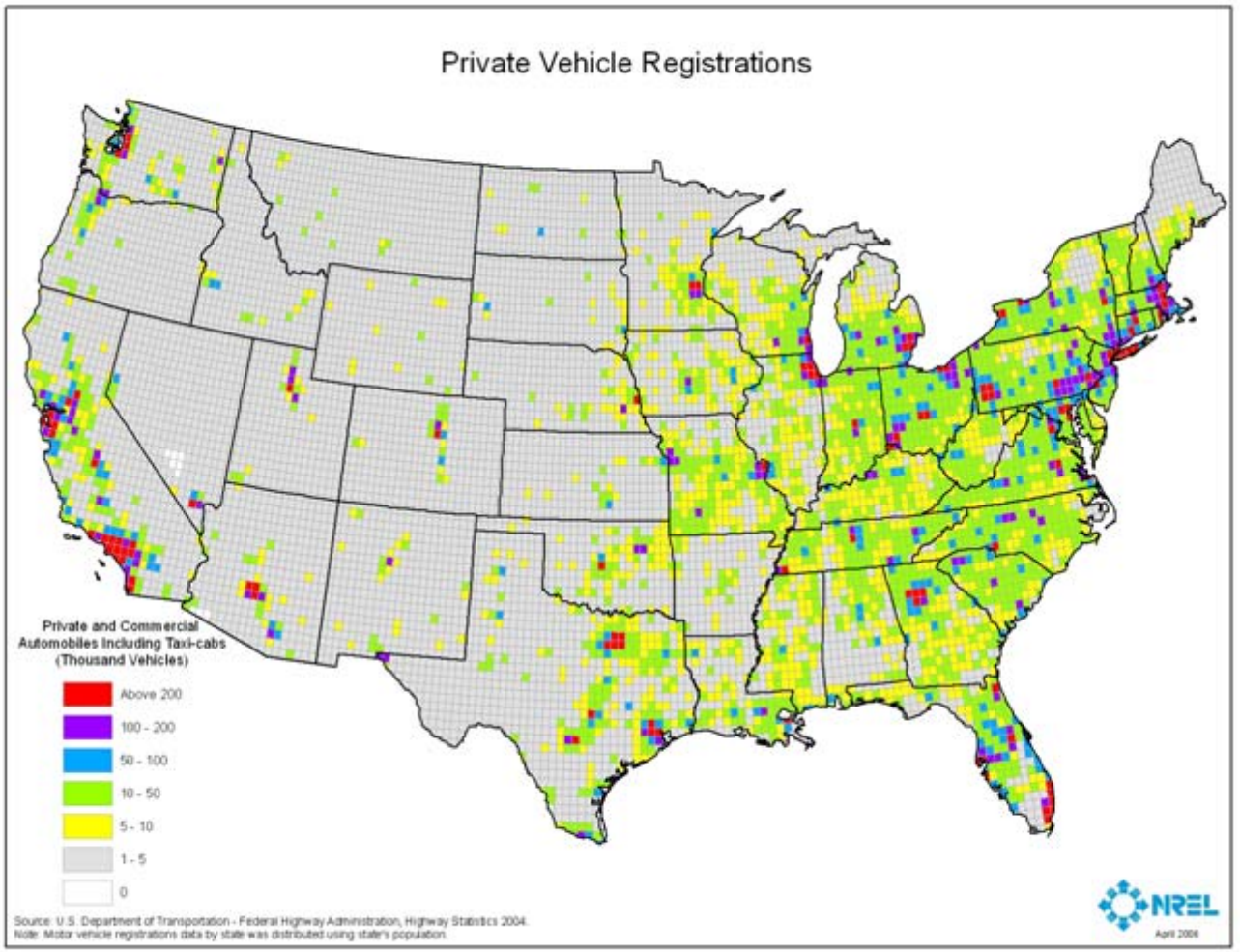
- 2+ vehicle households
- Education
- Commuting distance
- Employment

Identify Key Demographic Attributes Affecting Hydrogen Vehicle Adoption by Consumers



- Household income
- Air quality
- State incentives
- Clean Cities coalitions
- Hybrid registrations

Identify Key Demographic Attributes Affecting Hydrogen Vehicle Adoption by Fleets

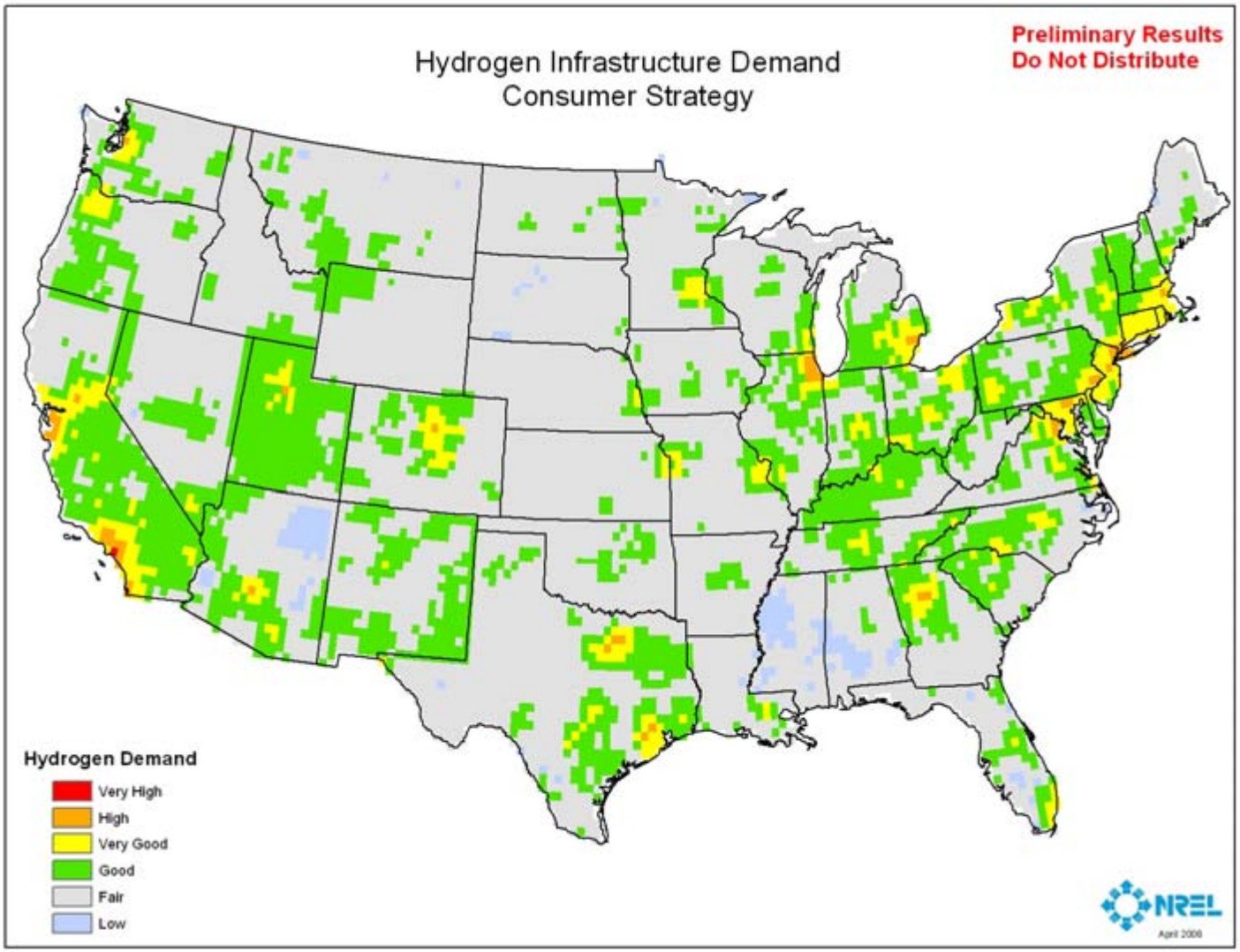


- Private fleet vehicles
- Public fleet vehicles

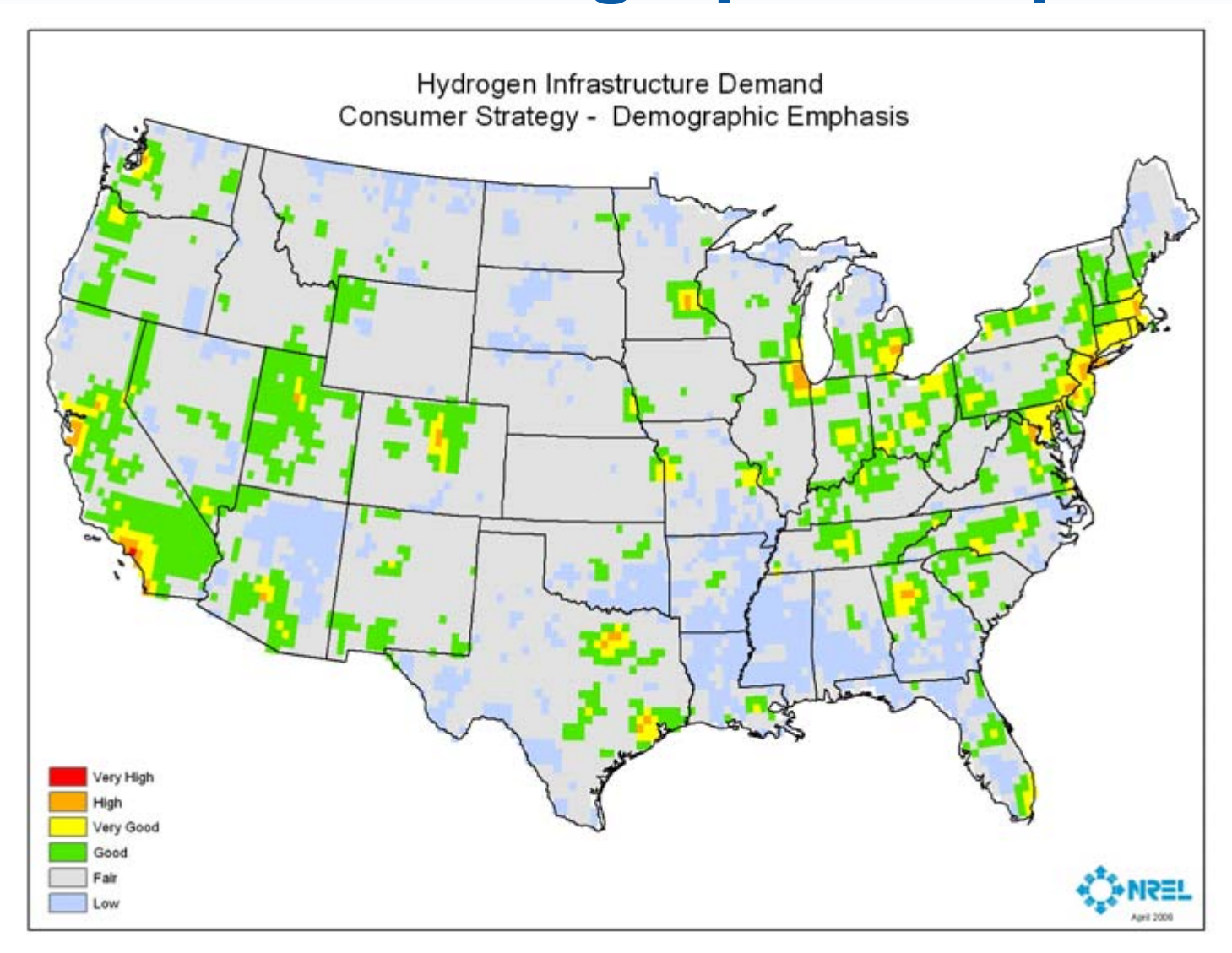
Prioritize Attributes

Attribute	Consumer Impacts	Fleet Impact
Households with 2+ Vehicles	H	
Household Income	H	
Education	M	
Commute Distance	M	
Employment	L	
State Incentives	H	M
Air Quality	M	H
Clean Cities Coalition	M	H
Hybrid Registrations	H	
Private Fleets		H
Public Fleets		H

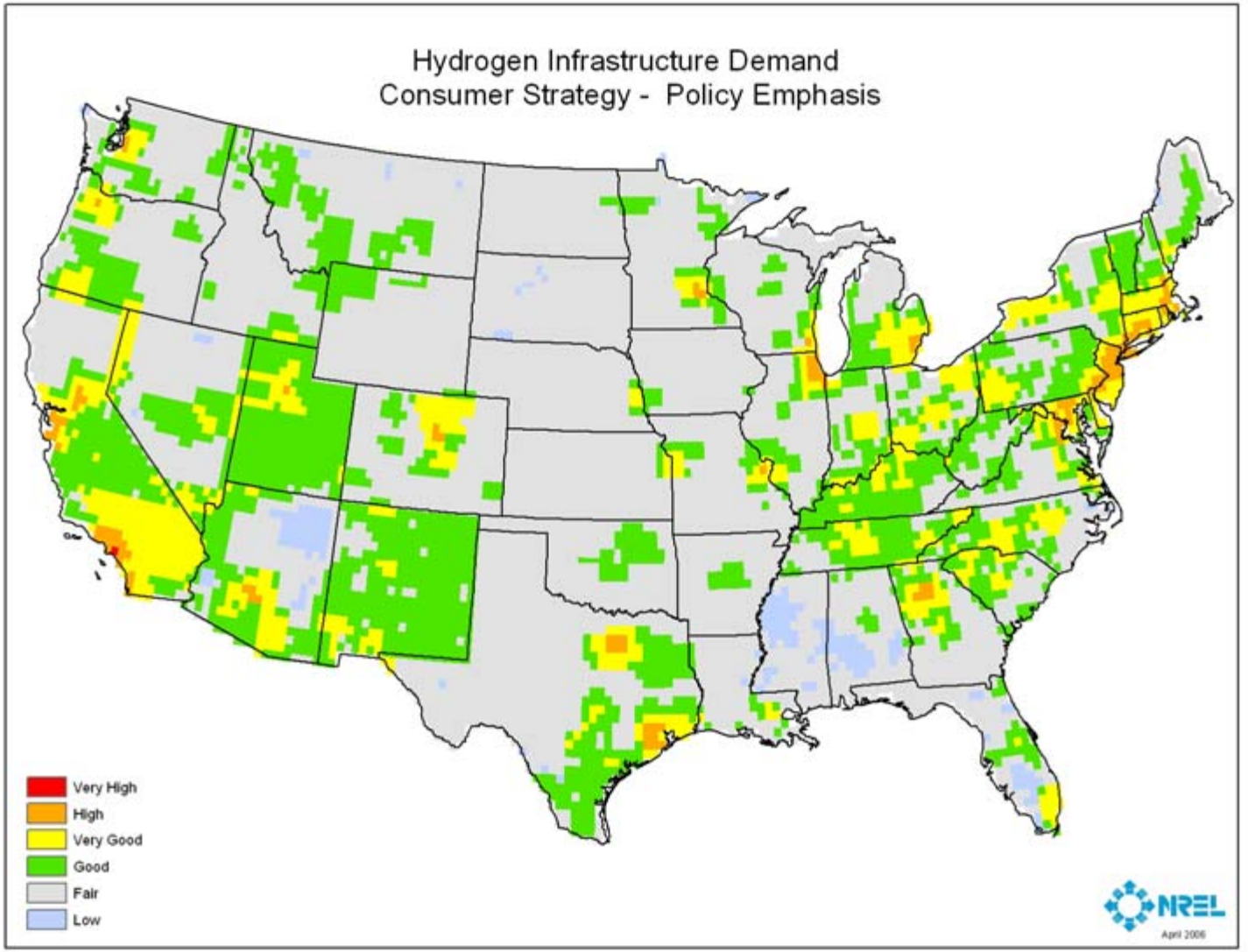
Consumer Results



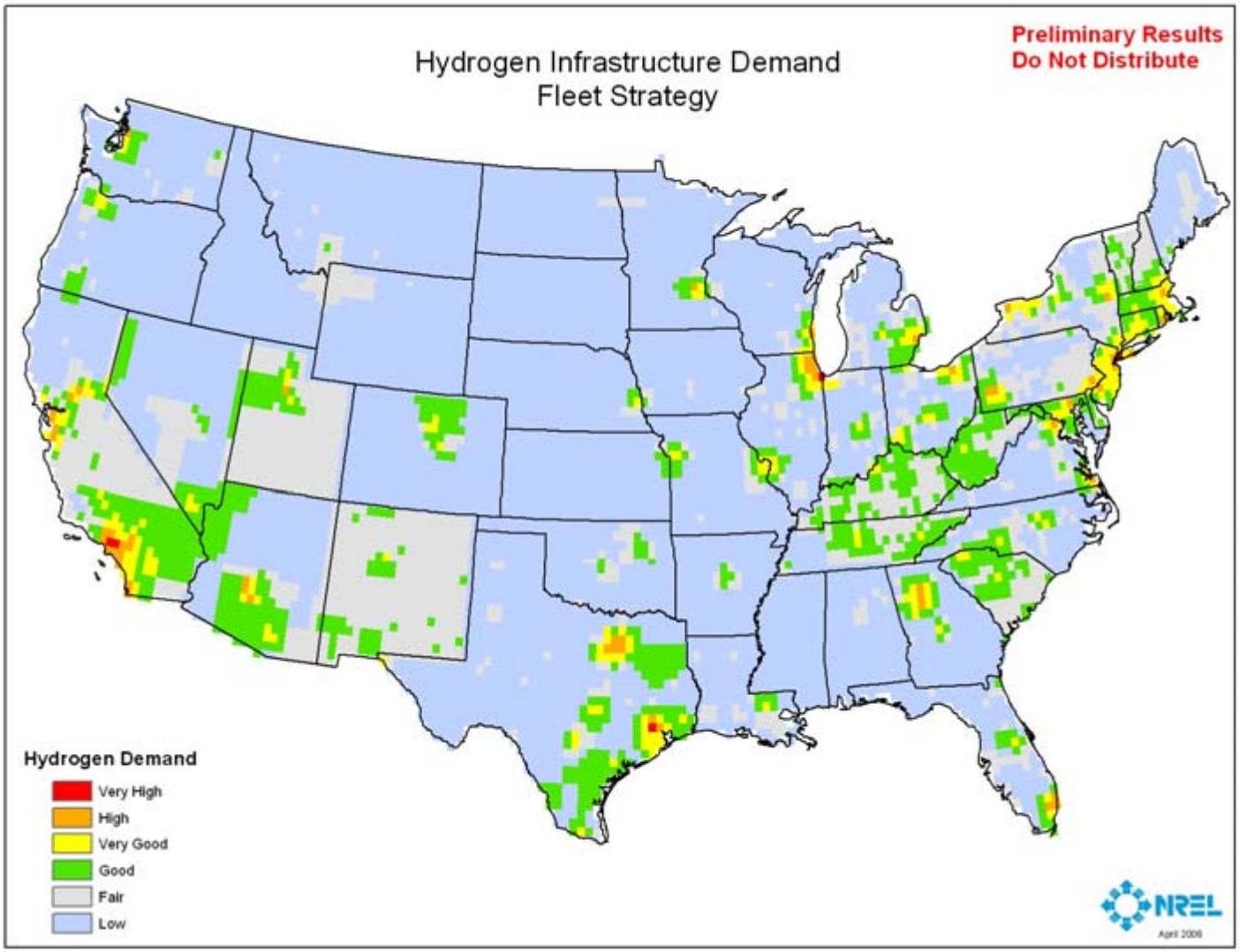
Consumer Demographic Emphasis



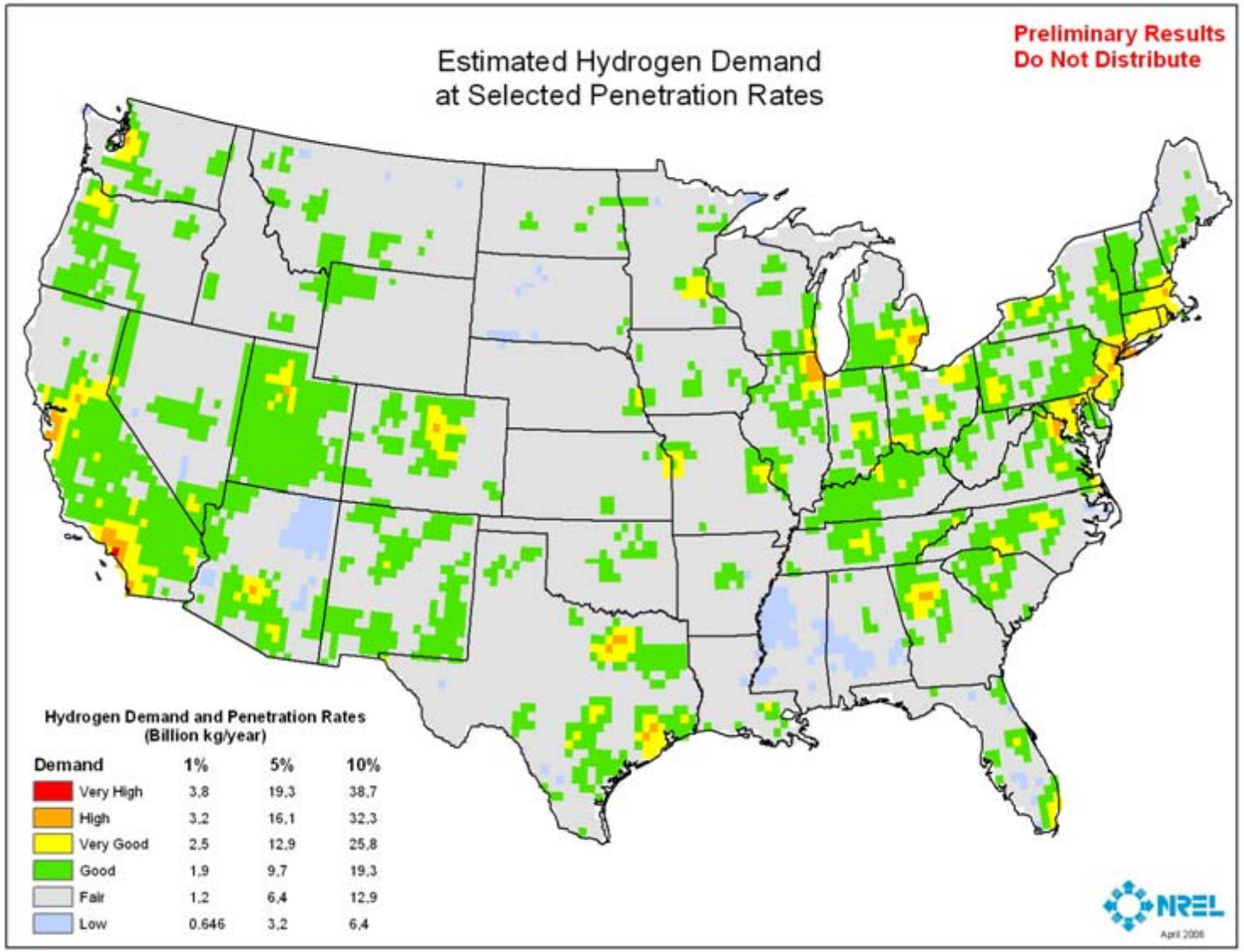
Consumer Policy Emphasis



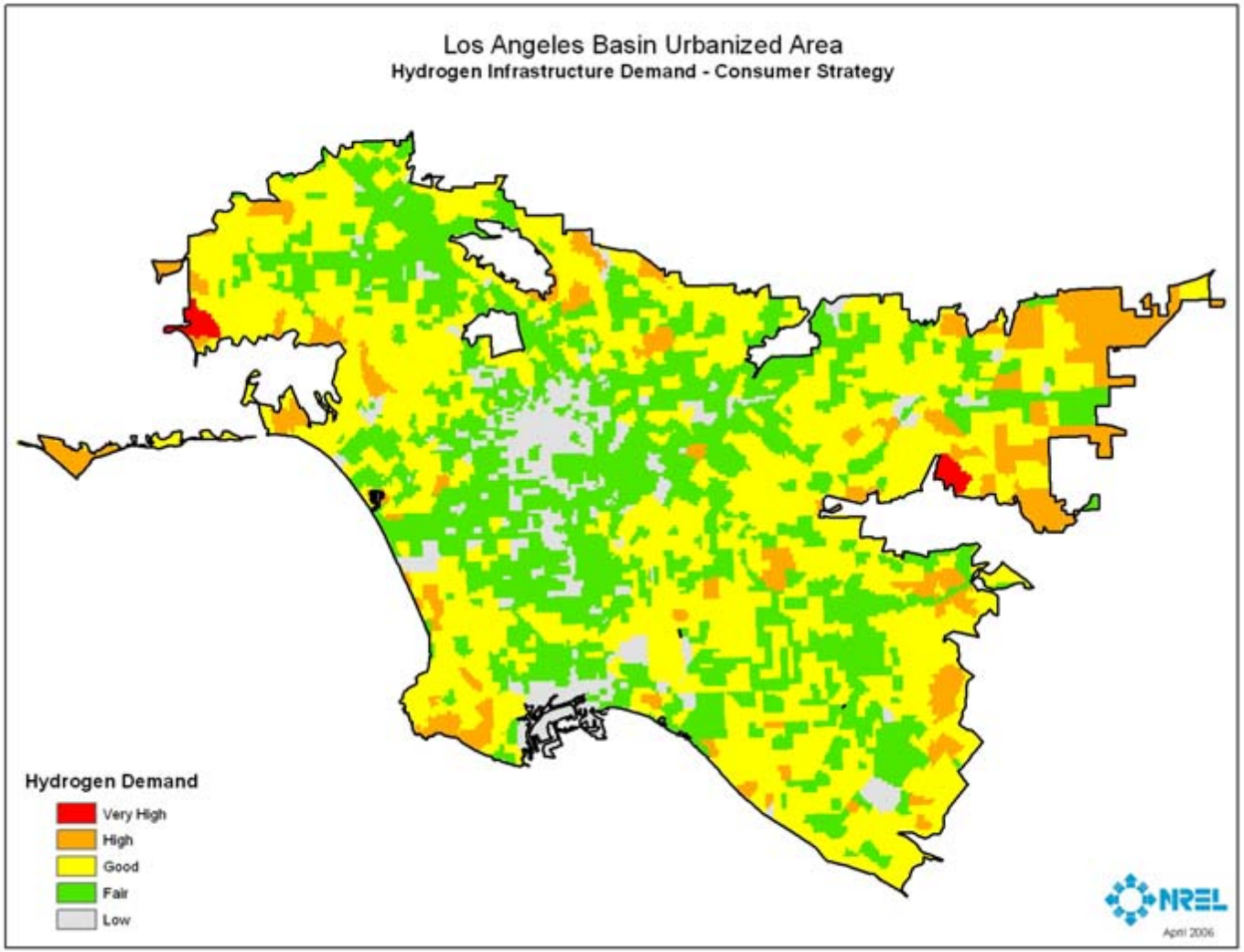
Fleet Results



Estimating Hydrogen Quantities

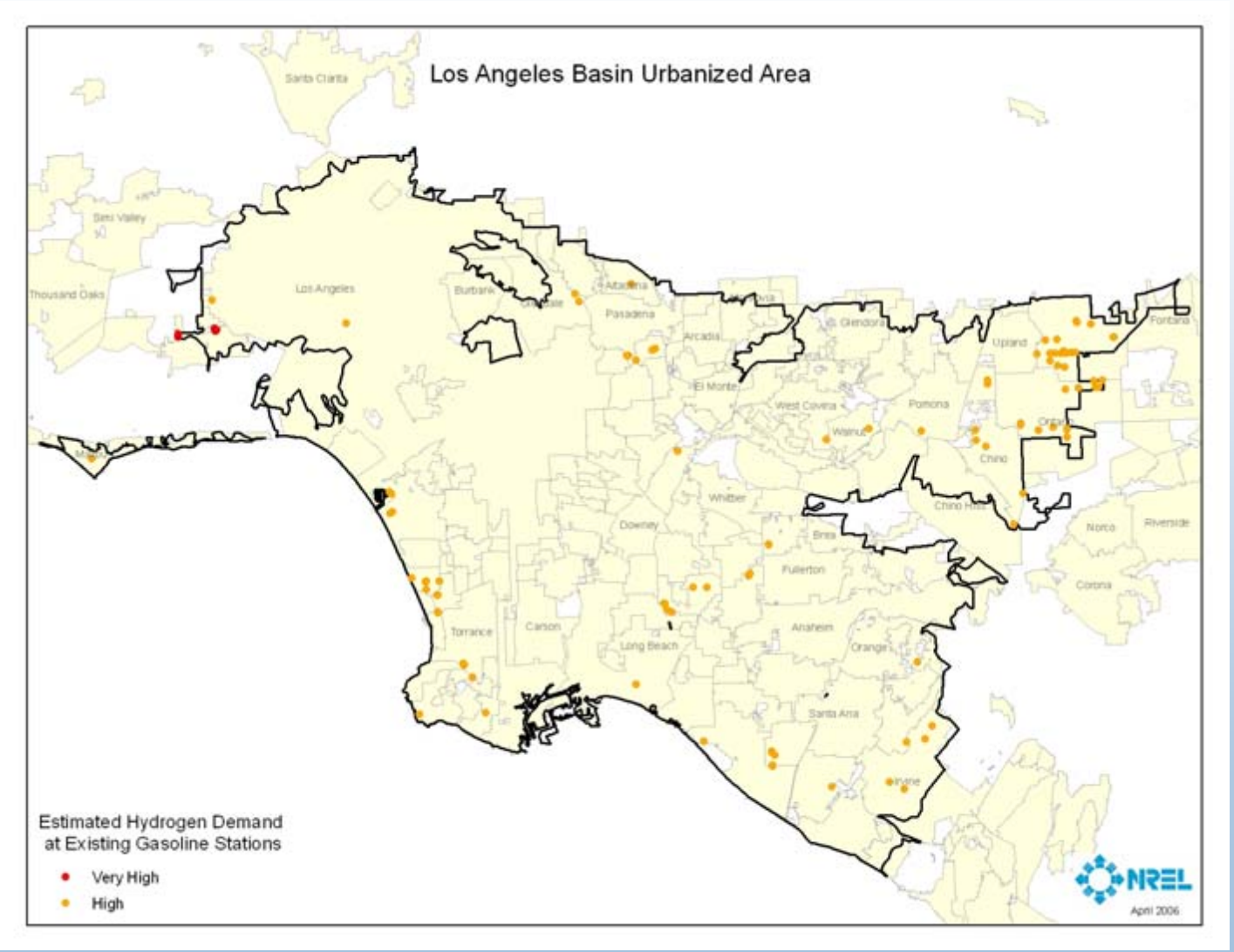


Local Demand Analysis



Can be applied to local areas with more detailed analysis and data

Local Hot Spot Analysis



Future Work

- Define infrastructure scenarios at various penetration rates
  - Match demand to hydrogen needs within each area
- Identify costs and potential for stranded assets
  - Use population trends to predict where hydrogen demand will grow rapidly
- Draft technical report to DOE July 2006

Project Summary

- U.S. demand results indicate that government policies can influence geographic areas surrounding major metropolitan areas
- Different areas have different demographic and geographic constraints that affect hydrogen demand dispersion
- Geographic demand is critical to infrastructure analysis
  - Provide a spatial component to other transition analyses (HyTrans, HYDS, MSM)
  - Provide a spatial component to non-transition analyses (HOPE, H2A)

Responses to Previous Year Comments

Comment	How Addressed
Give more emphasis to lessons learned from alternative fuels	Attributes were based on alternative fuels lessons learned research and experience
Focus is only on interstates	Expanded to identify demand nationwide and will use that demand to identify infrastructure needs
Assumes government-driven rather than industry/economics	Attributes selected balance general consumer demographics with government stimulation

Publications and Presentations

Publications

Melendez, Margo and Milbrandt, Anelia, *Analysis of the Hydrogen Infrastructure Needed to Enable Commercial Introduction of Hydrogen Fueled Vehicles*, March 2005

Melendez, Margo, *Transitioning to a Hydrogen Future: Learning from the Alternative Fuels Experience*, February 2006

Presentations

- 2005 DOE Hydrogen Program Review poster
- 2006 American Association of Geographers Conference presentation

Critical Assumptions and Issues

- Consumers will be satisfied refueling near their homes
- Attributes and weightings selected are appropriate; need to get better industry feedback