Hydrogen Transition Infrastructure Analysis

Margo Melendez & Anelia Milbrandt
National Renewable Energy Laboratory

May 25, 2005

This presentation does not contain any proprietary or confidential information

Project ID
#TVP14

Overview

Timeline

- Project Start: FY04
- Project Complete: FY06
- Percent complete: 40%

Budget

100% DOE project funding

- FY04 Technical Validation Funding: $115K
- FY05 Cross-Cutting Analysis Funding: $200K

Barriers

- Hydrogen Delivery
  - A. Lack of Hydrogen/Carrier and Infrastructure Options
- Technology Validation
  - C. Hydrogen Fueling Infrastructure

Partners

- H2A Analysis
- UC Davis Infrastructure Analysis

Objectives

- Understand the benefits and drawbacks of various options for installing hardware for a developing hydrogen demand
- Identify the most economic pathways for successfully meeting emerging hydrogen demands.
- Identify, describe, and quantify options for hydrogen refueling during the transition to hydrogen as a transportation fuel

Approach

- Geographic Information System (GIS) used for spatial analysis to identify station locations based on key factors:
  - Interstate highways
  - Traffic volumes
  - Existing H_2 and natural gas infrastructure
  - Driving distance (100 miles west of Mississippi, 50 miles east of Mississippi)
  - Population centers
  - Existing H_2 production facilities

Approach

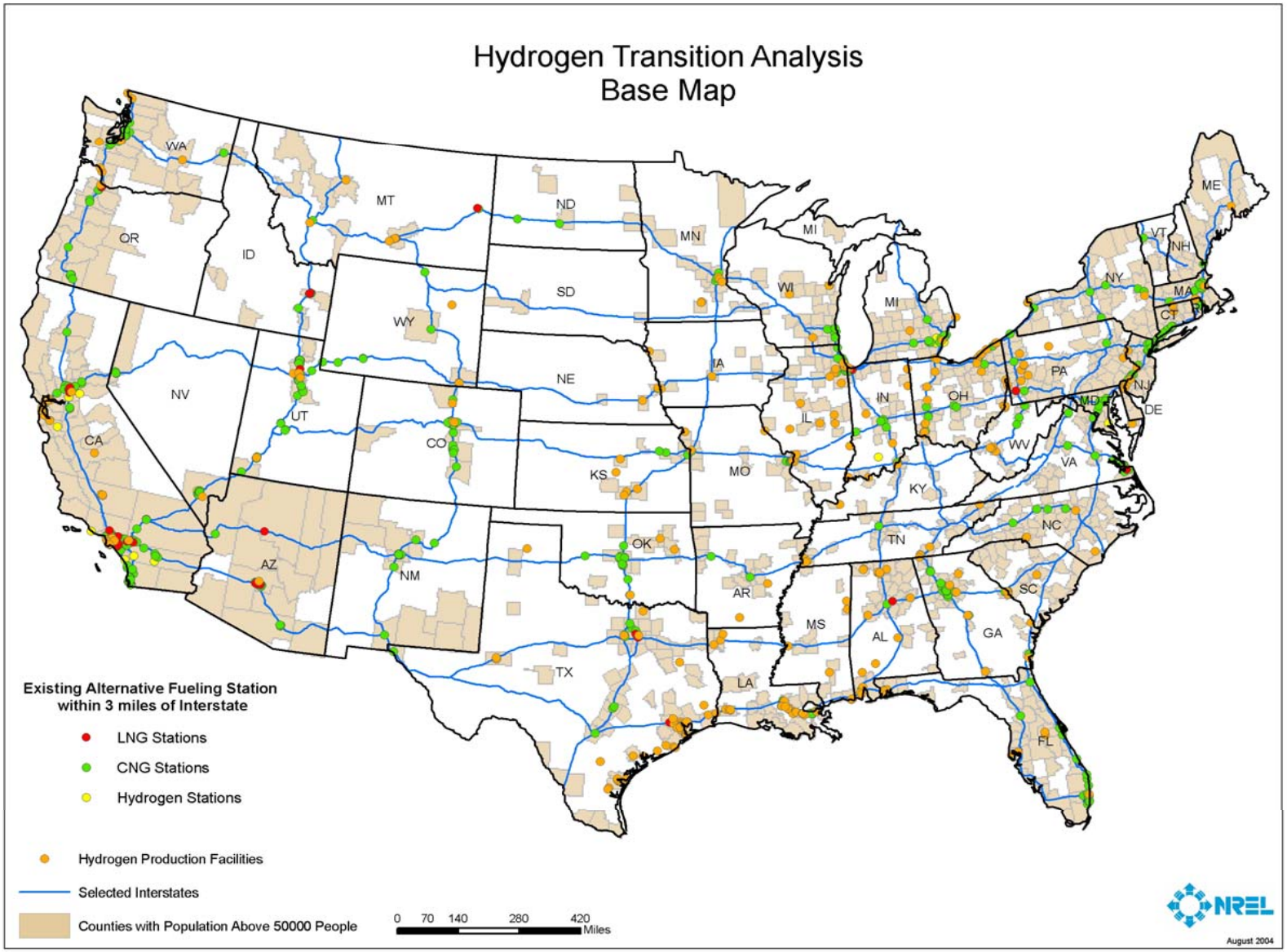
- Identify a basic, minimal network of refueling stations to facilitate interstate travel
  - Incorporates a subset of all U.S. interstates
  - Incorporates stations in all 50 states
  - Uses highway 101 in California because of high traffic volumes on interstate

Approach

- Evaluate transitional opportunities
  - Identify key partners (federal fleets, private fleets, states, petroleum depots, etc.) based on their activities and resources

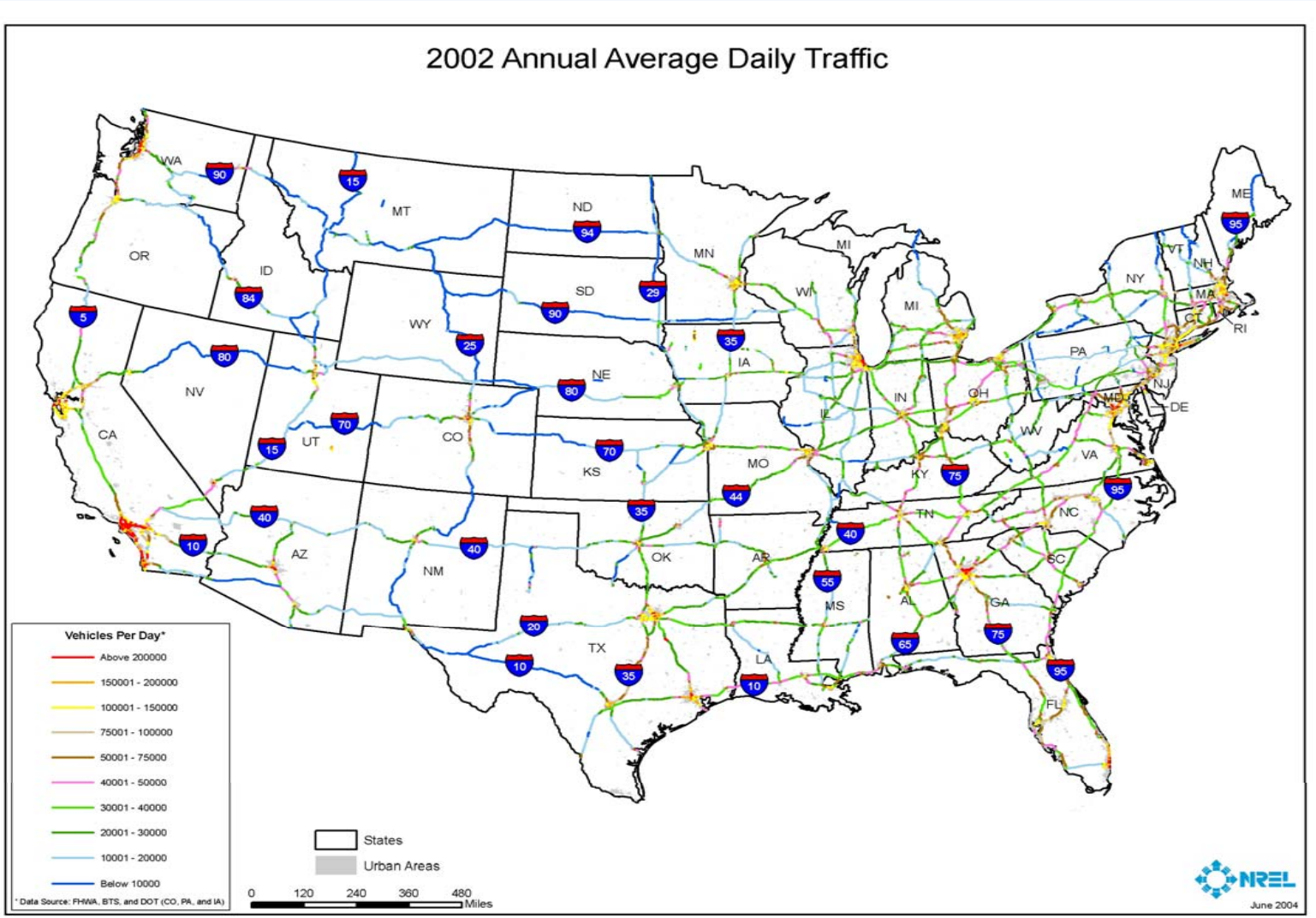
Technical Accomplishments

Key resources identified



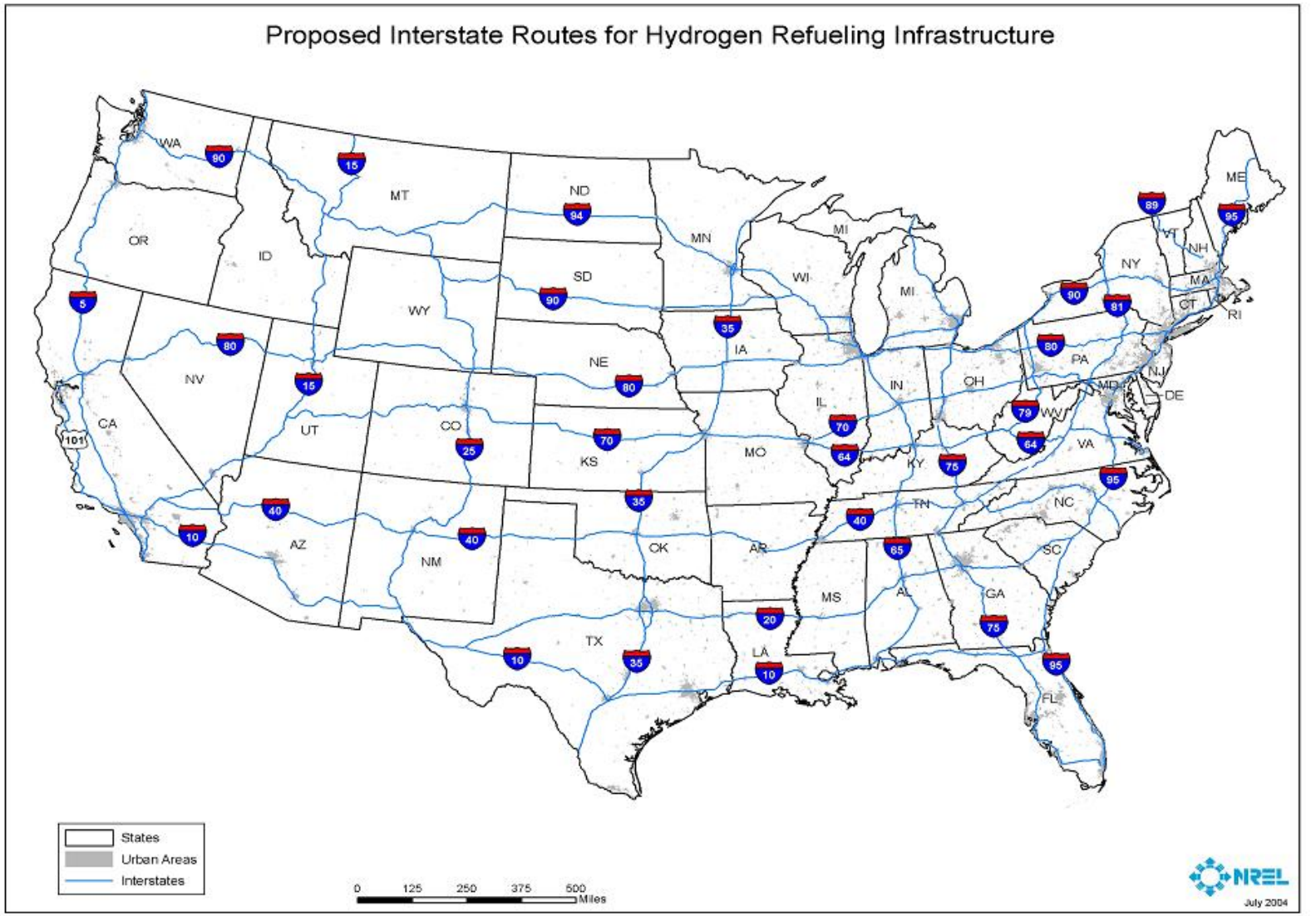
Technical Accomplishments

Interstate traffic analyzed



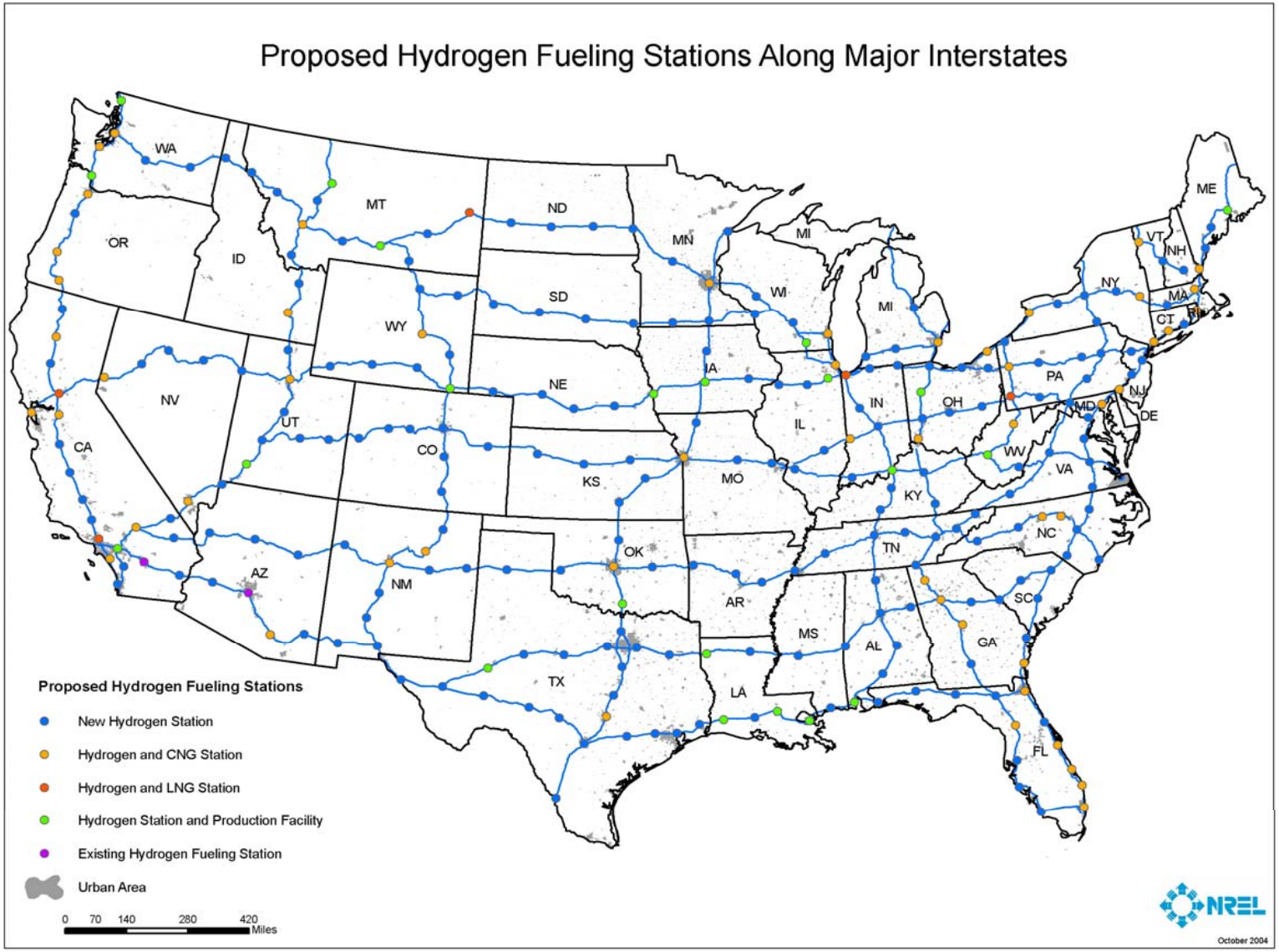
Technical Accomplishments

Interstate network identified



Technical Accomplishments

Individual stations placed on interstate network



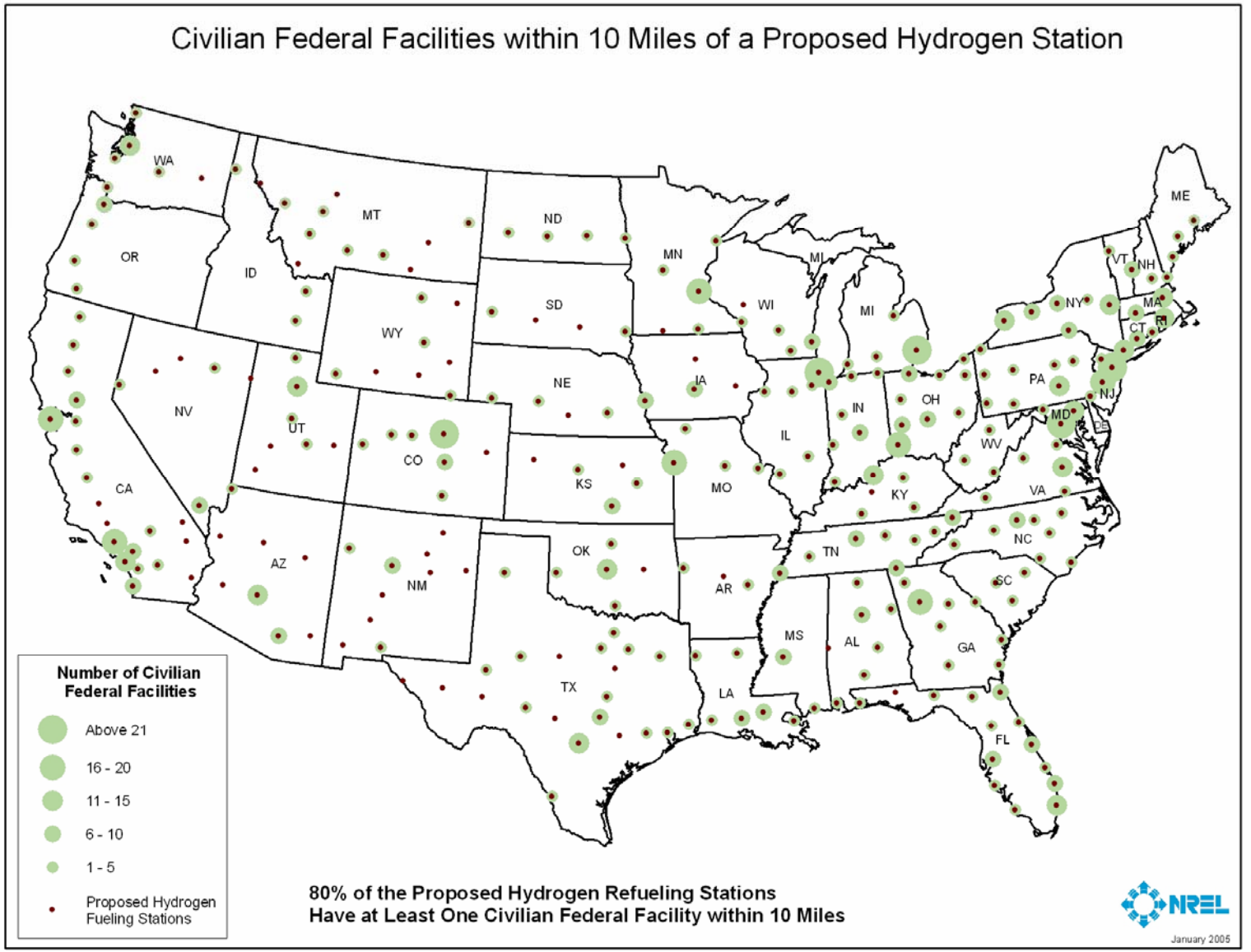
Technical Accomplishments

Interstate Station Summary

Interstate	Mileage	Number of Stations	Existing Natural Gas Stations	Existing H2 Stations	Sites Near H2 Production Facilities	New Stations Needed
5	1,381	20	10	0	2	8
10	2,460	29	1	2	5	21
15	1,434	17	5	0	3	9
20	1,539	18	1	0	2	15
25	1,063	13	3	0	1	9
35	1,568	18	4	0	2	12
40	2,555	28	5	0	0	23
64	938	7	0	0	2	5
65	887	11	1	0	1	9
70	2,153	23	3	0	0	20
75	1,786	19	6	0	1	12
79	343	5	3	0	1	1
80	2,900	33	6	0	4	23
81	855	9	0	0	0	9
89	191	3	1	0	0	2
90	3,021	35	7	0	2	26
94	1,585	16	6	0	0	10
95	1,920	30	13	0	1	16
Total Mileage	28,580					
Total Stations		284	58	2	22	202

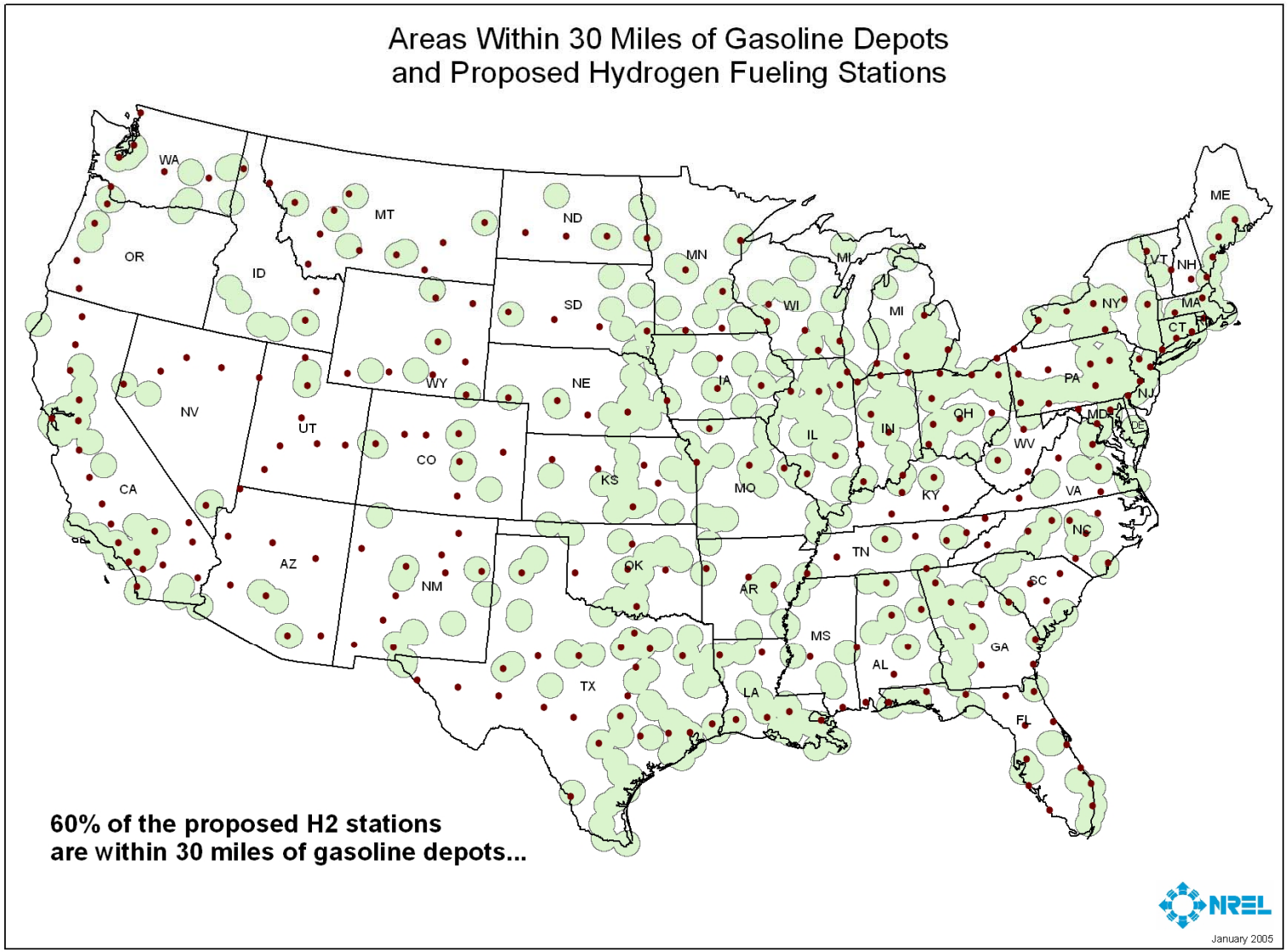
Technical Accomplishments

Identified significant potential for Federal Government involvement in H_2 infrastructure development



Technical Accomplishments

More than 60% of stations within a 30 mile radius of petroleum depots



Future Work

FY04 work funded by Technology Validation

FY05 work transitioning to Cross-cutting Analysis

FY05 Milestone: Technical report - 9/05

FY05 Activities

- Incorporate H2A assumptions and results
  - What are the best configurations for stations?
  - What are the costs to construct this basic infrastructure?
- Identify opportunities for renewable H_2 generation
  - Which renewable options are best for each region/station?

Future Work

FY05 Activities

- Identify/evaluate transition strategies
  - Who are key partners?
  - Where is the biggest early vehicle penetration?
  - Which stations/geographic areas where efforts should be focused first, second?
- Longer-term economic evaluation
  - Which stations should be built when?
  - How long before stations could be economically profitable?
  - What are the key attributes that make a station profitable?

Publications and Presentations

Papers

National Hydrogen Association (April 2005)

DOE Progress Report Deliverable (February 2005)

Presentations

SAE Government-Industry Meeting (May 05)

American Association of Geographers (April 05)

National Hydrogen Association (March 05)

Hydrogen Safety

No hydrogen safety issues are addressed