NGVs – A Clean Option for Transportation

Foro Internacional de Energia

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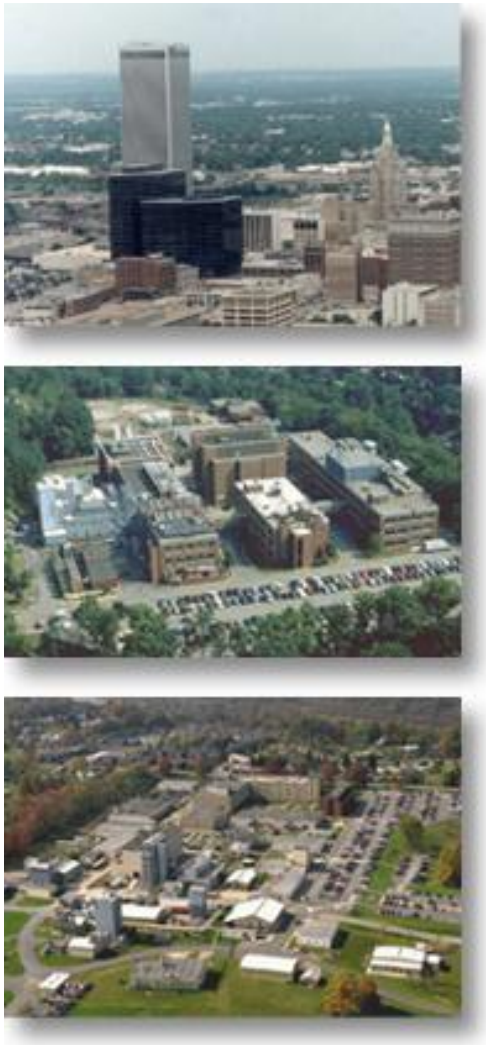
National Energy Technology Laboratory



- One of DOE's 17 national labs
- Government owned and operated
- Sites in Pennsylvania, West Virginia, Oklahoma, Alaska
- More than 1,100 federal and support contractor employees
- FY 2003 budget of $749.4 million

Overview

I. Transportation in the United States
II. The U.S. Clean Cities Program
III. Clean Cities International
IV. GHG emissions and transportation

I. Transportation in the United States

Transportation in the United States

- **As of September of 2002, there are 126,341 NGVs in the United States (compared with 1.1 million in Argentina)**
- **The number of vehicles in general is expected to almost double in the next 25 years**
- **Concern as a National Security issue:**
  - 97% of transportation fuels are derived from petroleum
  - More than 53% of U.S. oil is imported
  - Foreign oil demand will increase to 60% by 2005

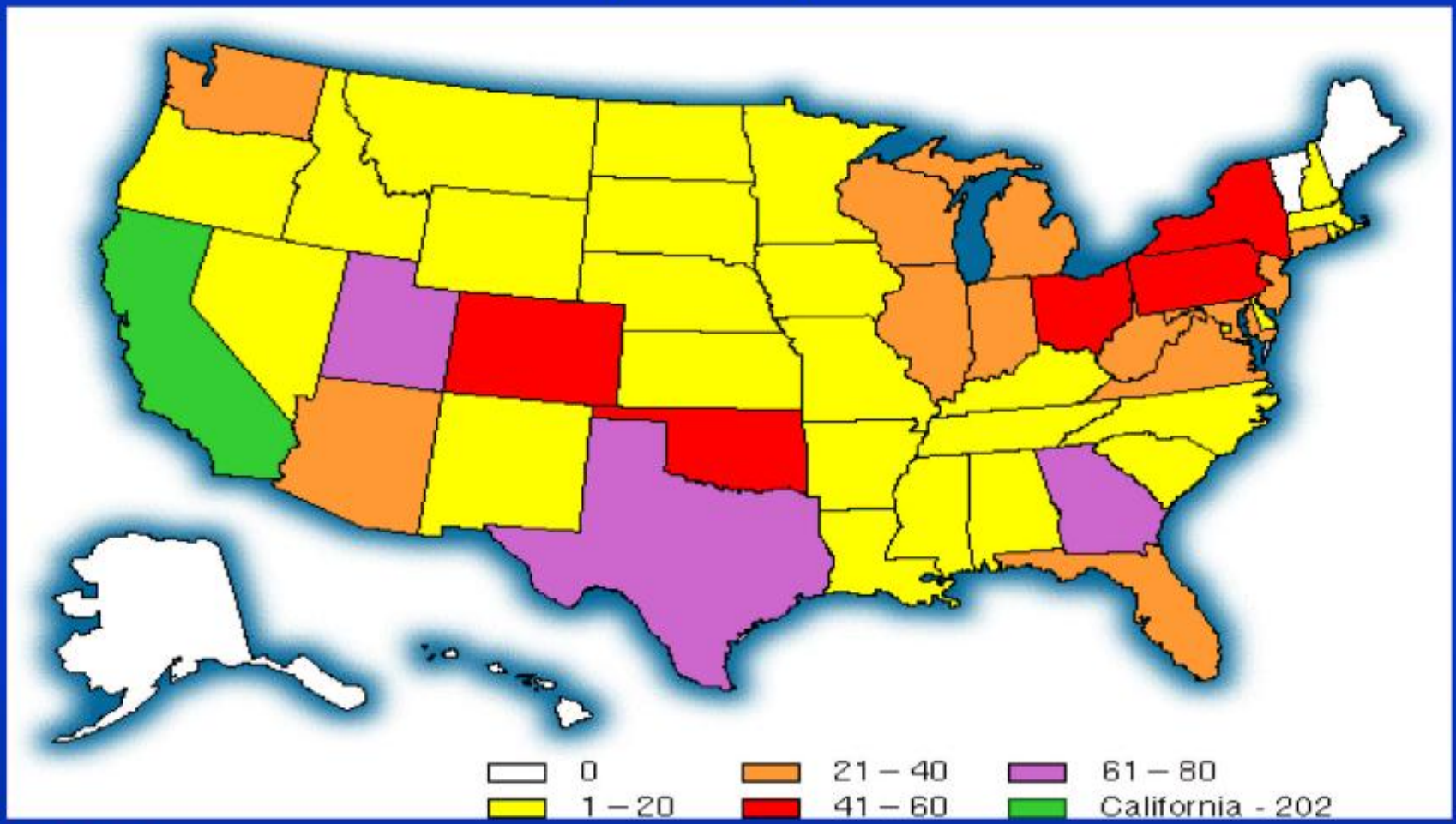
Breakdown of U.S. CNG Market

				Average	2001	Vehicle Fuel	Average Vehicle
	In-Use Vehicles			Annual Growth %	Percentage of	Consumption (gge)	Fuel Consumption (gge)
Fuel Type	1992	2000	2001	Rate 1992 - 2001	Total	2000	2000
CNG	23,191	101,991	**109,730**	41%		**104,501,000**	**1025**
LDV		82,384	88,728			40,416,000	491
HDV		19,607	21,002			64,085,000	3268
Private		57,796	**57,481**		52%	44,623,000	772
LDV		47,400	47,121				
HDV		10,396	10,360				
State		29,733	**35,335**		32%	54,865,000	1845
LDV		21,415	25,514				
HDV		8,318	9,821				
Federal		14,462	**16,914**		15%	5,013,000	347
LDV		13,569	16,093				
HDV		893	821				

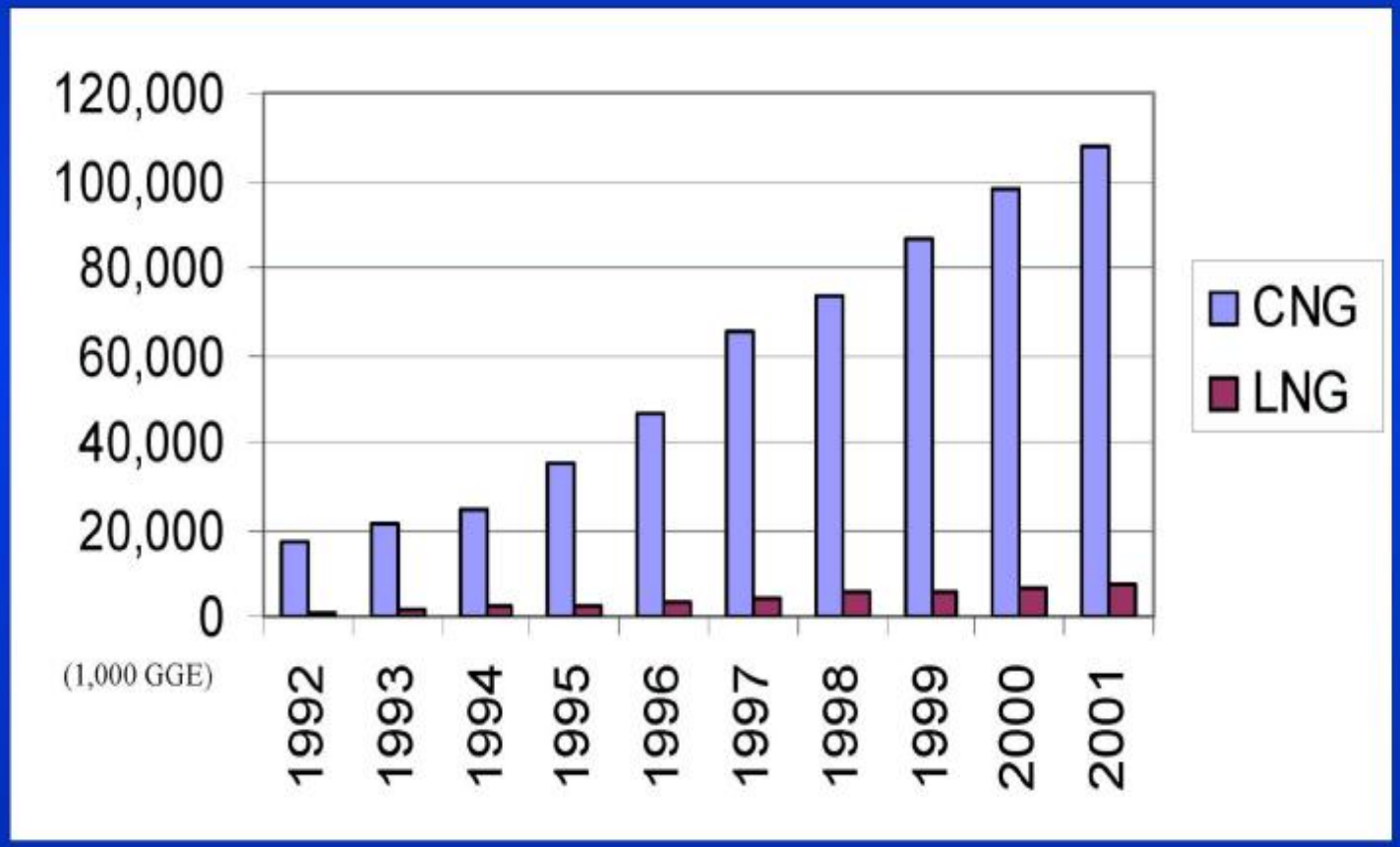
Breakdown of U.S. LNG Market

				Average	2001	Vehicle Fuel	Average Vehicle
	In-Use Vehicles			Annual Growth %	Percentage of	Consumption (gge)	Fuel Consumption (gge)
Fuel Type	1992	2000	2001	Rate 1992 - 2001	Total	2000	2000
LNG	90	1,682	**2,039**	241%		**7,460,000**	**4435**
LDV		118	221			65,000	551
HDV		1,564	1,818			7,395,000	4728
Private		355	**472**		23%	1,183,000	3332
LDV		75	117				
HDV		280	355				
State		1,187	**1,514**		74%	5,878,000	4952
LDV		43	60				
HDV		1,144	1,454				
Federal		140	**53**		3%	399,000	2850
LDV		-	44				
HDV		140	9				

U.S. Natural Gas Fueling Stations (CNG)



CNG & LNG Consumption



II. The U.S. Clean Cities Program

Clean Cities Program Mission

To advance the national, economic and energy security of the United States by supporting local decisions to use domestically produced non-petroleum fuels in vehicles.

Industry Perspective

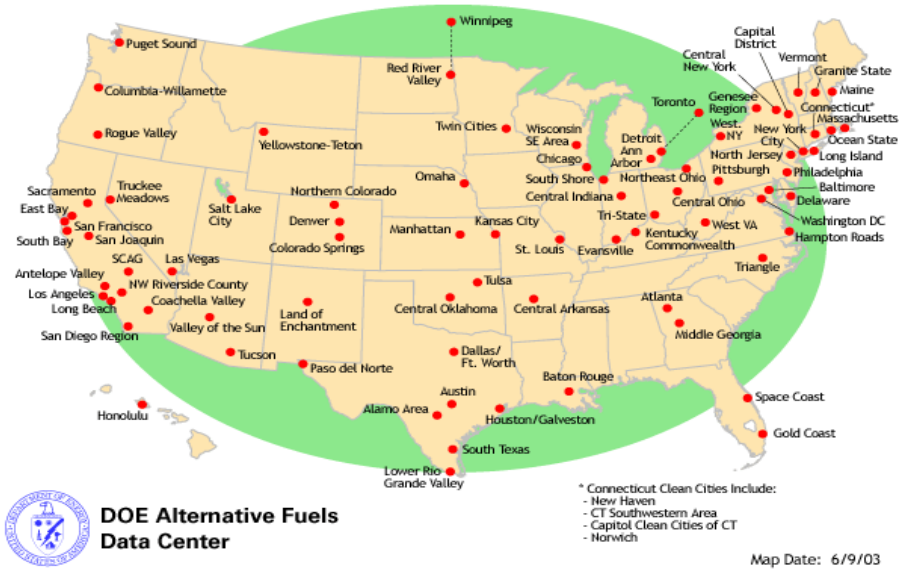
Jack Requa, VP and COO - Bus Services,

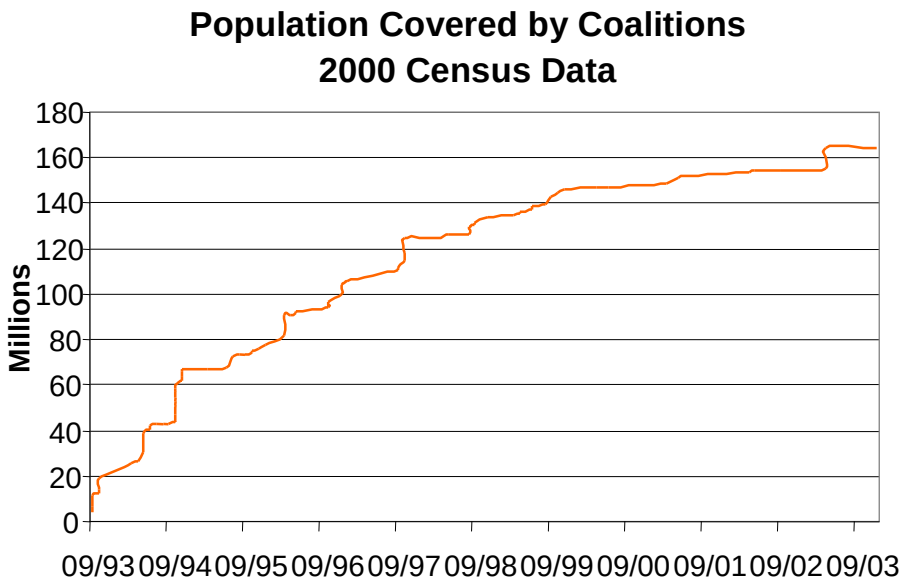
Washington Metropolitan Area Transit Authority

"When WMATA considered introducing natural gas buses to its fleet, Clean Cities staff smoothed the way with objective and credible information for our Board of Directors, and consulting help to develop the specifications for our new refueling site. Clean Cities has been our partner from start to finish."

Clean Cities Program

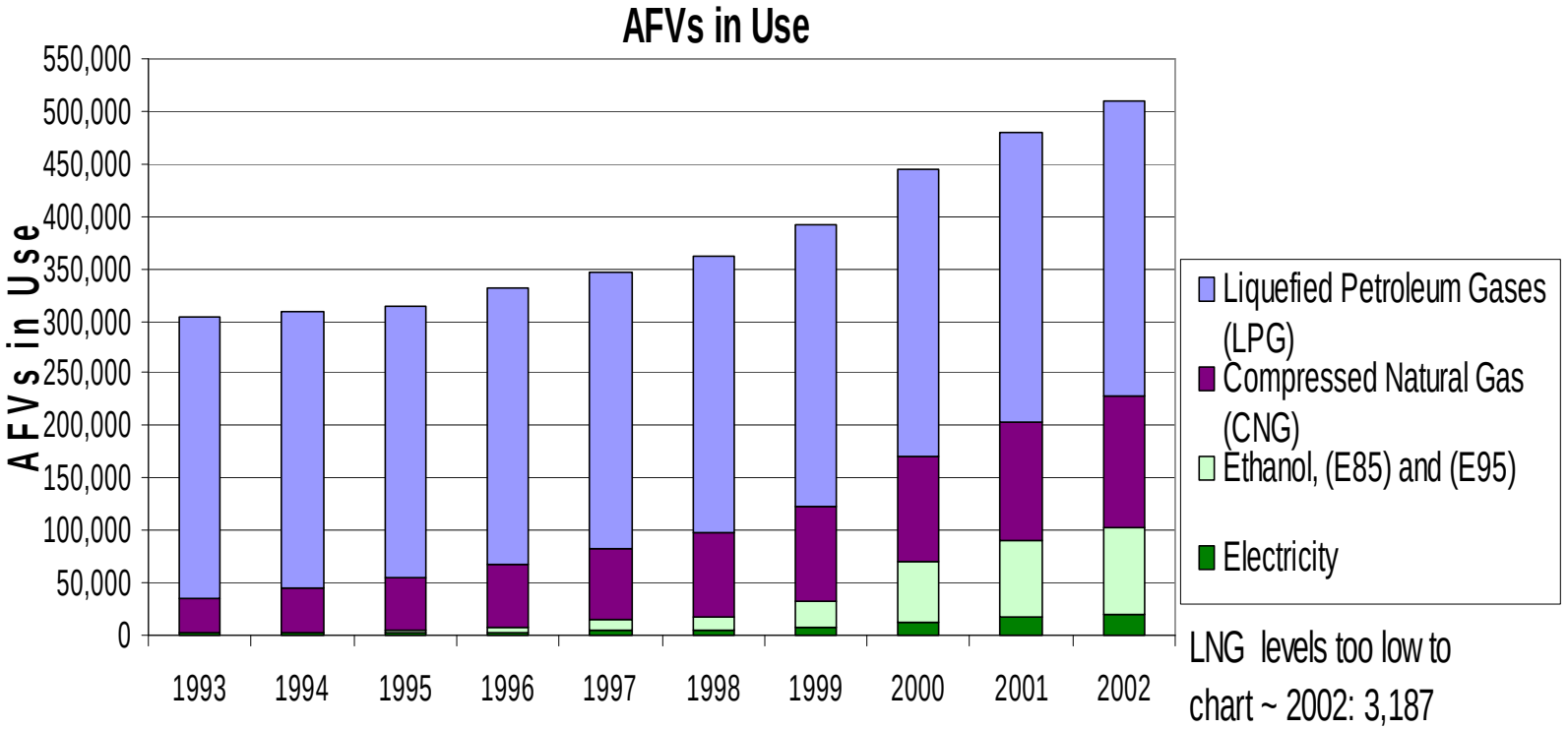
Coalitions: **80 locations covering 58% of U.S. population**





Clean Cities is Helping with Growth

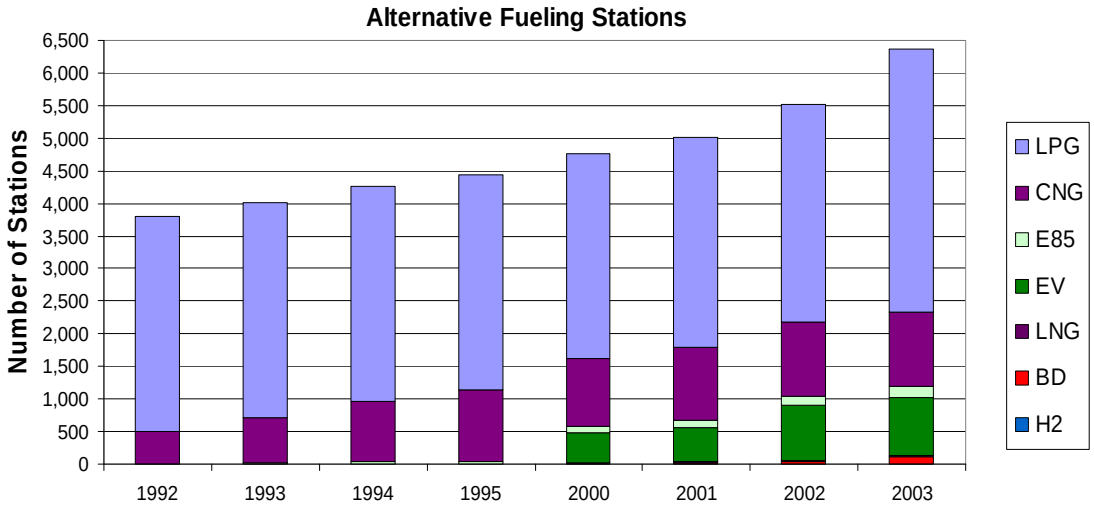
Vehicles: **17%/yr. growth in coalitions compared to 7%/yr. growth in rest of the country**



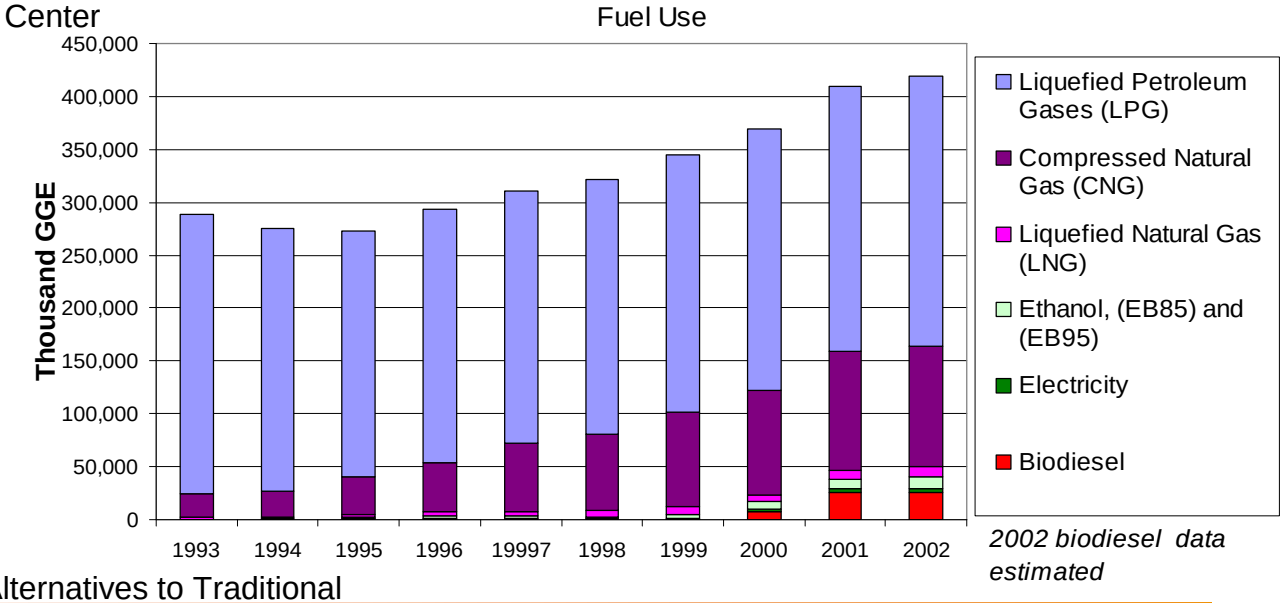
NOTE: 2,652,592 flex fuel (E85) vehicles in 2000. Chart shows estimated vehicles using E85 fuel.

Source: EIA, Alternatives to Traditional Transportation Fuels 2000

Fueling: **Momentum is growing**



Source: NREL Alternative Fuels Data Center



2002 biodiesel data estimated

Source: EIA, Alternatives to Traditional Transportation Fuels 2000

Clean Cities: Program Trends

- **Established in 1993 to meet EPAct requirements**
  - Technical assistance and information for regulated fleets
  - Financial assistance to localities with approved plans
  - Initial focus on vehicle availability for government fleets
- **Evolved to focus on integrated fuel/vehicle implementation in niche markets**
- **More recent expansion to support consumers' flex-fuel vehicles, hybrids**
- **Growing industry momentum on fuel infrastructure**
- **Increasing interest in domestic supply as driver**

Clean Cities: The Bottom Line

- **Clean Cities' 80 local coalitions, technical assistance, and information resources have made critical contributions to the growth of alternative fuels industry.**
- **The program can apply these assets and other lessons learned in accelerating use of a broader portfolio of transportation options.**
- **Clean Cities can serve as a cornerstone of the U.S. near-term strategy for reducing our dependence on imported oil.**

III. Clean Cities International

Clean Cities International

GOAL: **Facilitate international exchange and government/industry partnerships to promote alternative fuel technologies to address shared energy and environmental issues**

ACTIVITIES:

- Reverse Technology Tours
- Information Exchange
- Training
- Coalition Formation

International Barriers to NGVs

- Fuel Availability & Quality Inconsistent
- Random Station Design and Placement
- Codes & Standards Not Regulated or Enforced
- Training Not Incorporated in Program
- Collaboration Between Local Parties Difficult
- Monitoring of Environmental Benefits Necessary

Clean Cities Around the World

Border Coalitions Current CCI Activity Expressed Interest

CC International: What's happening around the World

- **Autogas (LPG) growing 15-20% annually in international markets**
- **NGV conversions are expected to average 10% annually worldwide**
- **<u>Peru:</u> CFT Dispensers reports current sales of $65k per year. CCI facilitated partnership between local supplier and CFT.**
- **<u>Bangladesh:</u> Strategy is to reduce emissions from Dhaka's 50,000 "three-wheelers" by converting to CNG. As of April, 2003, there are 8,000 NGVs. Sixty filling stations planned for the end of the year.**

CC International: What's happening around the World

- **India:** Approximately 85,000 NGVs operate in Delhi. The entire city bus fleet of 10,000 moved to CNG. Taxis also being converted. 90 CNG stations and number is growing. CFT Dispensers reports potential for $75-100k in LPG-related orders per month. Visit to India under CCI mission was key to this success.
- **Mexico:** Potential to convert 2,000 small buses and 10,000 taxis to AFV in Mexico City. 500-600 vehicles are fueled daily at just one station. There are 3 stations in Mexico City and additional stations in 2-3 other Mexican Cities. CFT Dispensers reports $12-15k in LPG-related orders per month. IMPCO currently conducting LPG pilot project with 120,000 taxis.

Clean Cities International

Leveraging Funding

- **$150k DOE FY03 Funding**
- **$1.5 Million USAID Delhi Mission**
- **$100k USAID Dhaka Mission**
- **$250k USAID Manila Mission**
- **$10k-$20k from TDA, USAEP**
- **Outstanding proposals:**
  Mexico, Central America, Peru

Clean Cities Can Help — Provide Information/Services

Training

- **NGV Institute Training**
- **Technology Tours**
- **NAFTC-SIAM Training Partnership in India**
- **Organizing Coalitions**
- **Clean Cities Conference** Tools
- **Fleet Manager Tool – http://fleets.doe.gov**
- **NGV Emissions Manuel**
- **Alt Fuel Toolkit**

Clean Cities Products

- Clean Cities Web Site and Hotline
- Alternative Fuel News
- Case Studies/Fact Sheets

AFV Experts

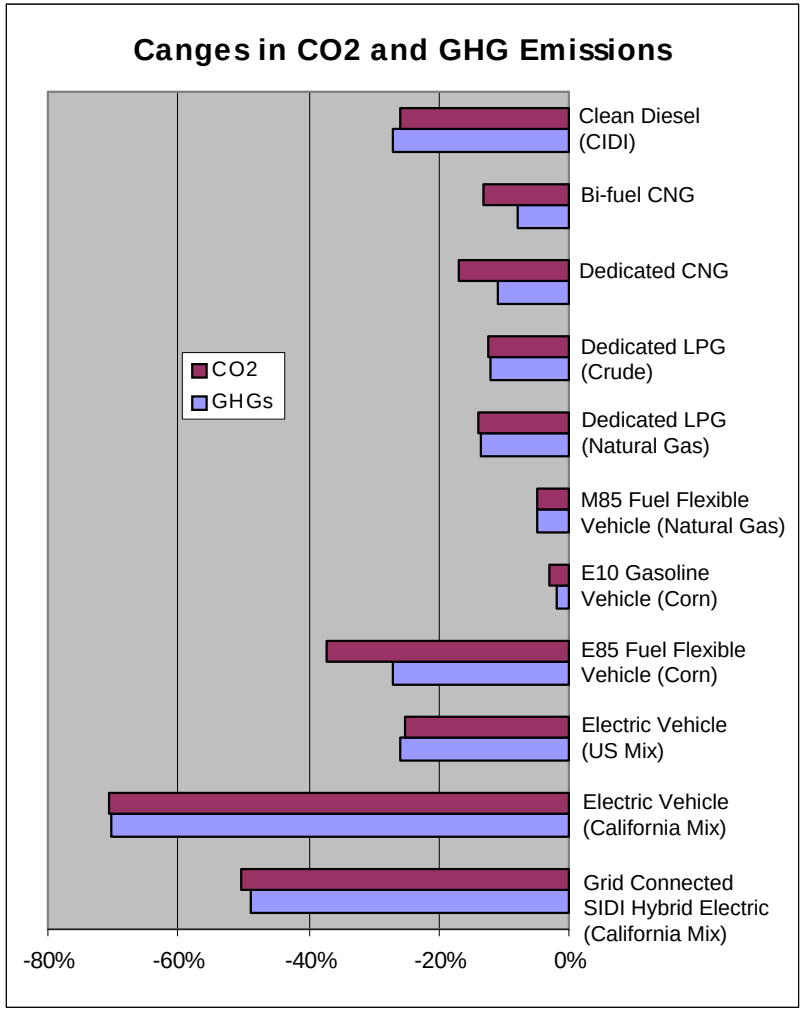
- Specialized Technical Assistance by "Tiger Teams"

IV. GHG Emissions and Transportation

GHG Emissions and Transportation

- Transportation contributes more than 20% of global GHG emissions
  - Fastest growing source of GHGs
- Motor gasoline yields about one-fifth of all U.S. GHG emissions
- AFVs reduce GHG emissions

Fuel-Cycle GHG Emissions Relative to Gasoline Vehicles Fueled with Clean Gasoline



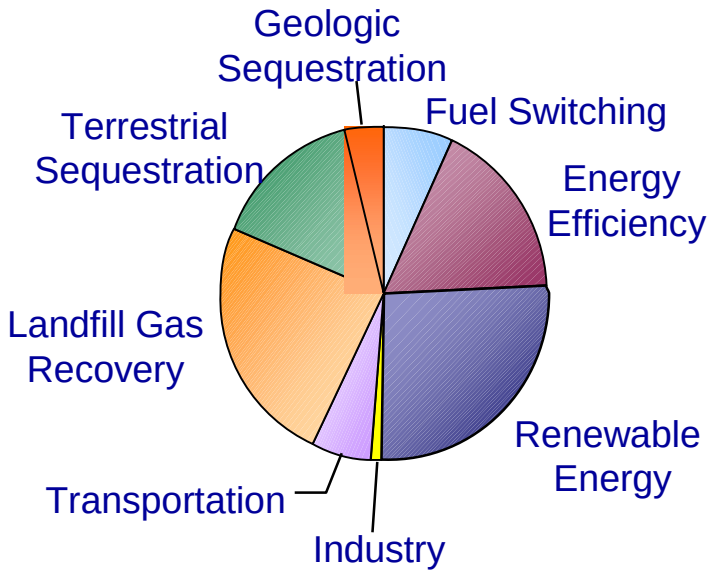
Source: ANL, GREET 1.5—Transportation Fuel-Cycle Model, Volume 1, August 1999

GHG Market and Transportation

Volumes traded since 1996

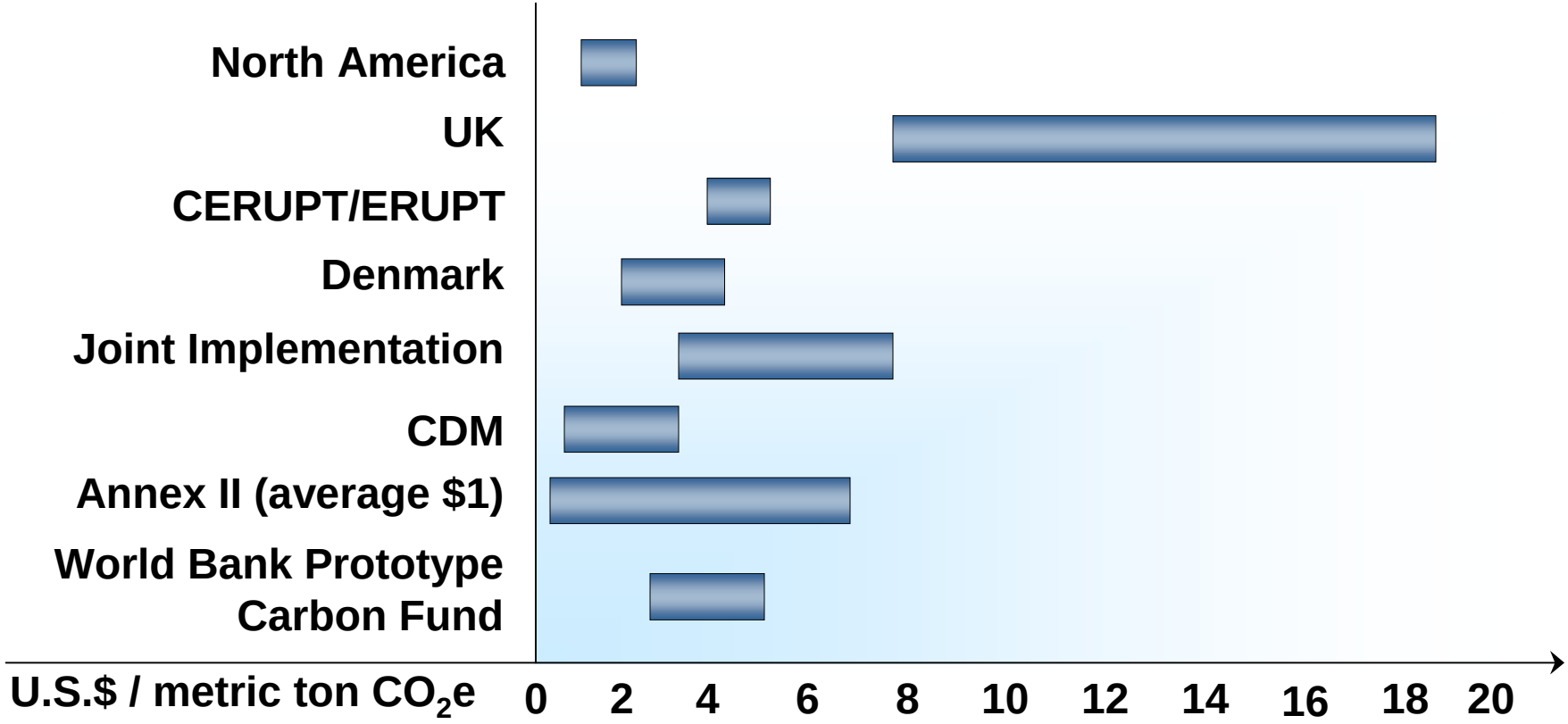
- **>280 transactions at 335 million metric tons CO_2E**
- **~4% of transactions = transportation**
- **Participation in GHG market can add economic value to transportation projects**

Trades by Mitigation Technology, 2001-2002



Sources: Point Carbon, (October 2002); PCF Plus Research World Bank, based on transaction database assembled with Natsource, Co2e.com and PointCarbon (October 2002)

Current Carbon Value



Formal trading, verification and consistent accounting protocols increase transaction value

Sources: PCF Plus Research World Bank, based on transaction database assembled with Natsource, Co2e.com and PointCarbon

Challenges For GHG Projects in the Transportation Sector

- **Absence of direct GHG regulation**
  - Fleet owners focus on policies to address local air pollution
- **Little GHG accounting guidance**
  - Which GHGs (CO_2, CH_4, and N_2O)?
  - Full fuel cycle versus tailpipe emissions?
  - Emissions per mile driven or unit energy consumed?
- **Additionality requirement**
  - Projects must be surplus to existing policies/regulations
- **Dispersed emission sources and many owners**
- **Fixed transaction costs favor large fleets**
- **Lack of monitoring and verification protocols**

Available GHG Accounting Guidance

- **NETL GHG resource guides**
  - CNG, EV/HEVs, and LPG vehicle projects
  - Case studies on project design and emission quantification
    - Including LPG motorcycle taxi project in Pucallpa, Peru
- **EPA developing International Vehicle Emissions Model (IVE)**
  - Estimating emissions from vehicles in developing countries
- **WRI/WBCSD draft accounting/reporting protocol for GHG mitigation projects**
  - Draft project types include:
    - Fuel switching, engine efficiency, haulage efficiency, transportation management initiatives
  - Inviting organizations to road test draft guidance
  - www.GHGprotocol.org

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