Growth of the NGV Market:

Lessons Learned

Roadmap for Infrastructure Development

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"Roadmap For Development of NGV Fueling Infrastructure and Analysis of Vehicular Natural Gas Consumption by Niche Sector"

- Report Underwritten by US Department of Energy
  - Contract managed through NETL
- Prepared by Clean Vehicle Education Foundation
  - May 2006 - August 2007

Scope of work

- Roadmap
  - Document CNG and LNG infrastructure development to date, assess critical factors, define challenges and opportunities and lessons learned to accelerate future public infrastructure development…
  - Focus on HD niche fleets (?)

- Data Collection
  - Quantify 2005 US vehicular natural gas consumption (CNG and LNG) by top niche sectors, by state and region, retail and “wholesale”

Data Collection Section

- Defines underlying problem with current data
  - Lack of fuel consumption and NGV inventory data tracking system
  - Extrapolation of old data has led to overestimation of current market
- Assesses past/present data collection methodologies
  - LDCs (AGA/NGVC), DOE EIA+EPACT, Clean Cities
- Investigates/evaluates potential approaches
  - State PUC filings, MVA records, excise tax records

Data Collection Process

- CA PUC filings used to determine volume, niche sector data extrapolated from fairly reliable data sets

- Other states: utilities and/or stations were contacted
  - AFDC database served as reference; add'l sites added (500+ locations, 75+ utilities, 2000+ calls, e-mails, letters)
  - Confirm station existence, add stations not on AFDC db
  - Utility bills, tax records and/or interview station operators to assess customer counts, fleet types, fuel usage

Data Collection Process

- LNG calculated by cross-referencing production at plants against proprietary sales and customer data provided by major LNG suppliers
- Cross-check station locations and NGV inventory estimates against known fleets
  - Industry and Gov't Directories, Historical Reports, Web sites, Press Releases, Interviews
  - Weigh all the info, check to see if it passes "smell test"

Summary of Data

- 892 stations listed fuel use
  - down from 1250 in ‘97
  - 157 “new” locations added
  - 51 deleted from AFDC db
- Additional stations exist but have little or no fuel use
- Station count = approximately 82% of 1100 stations believed to be in existence
- Survey data capture estimated at 95+% of fuel throughput

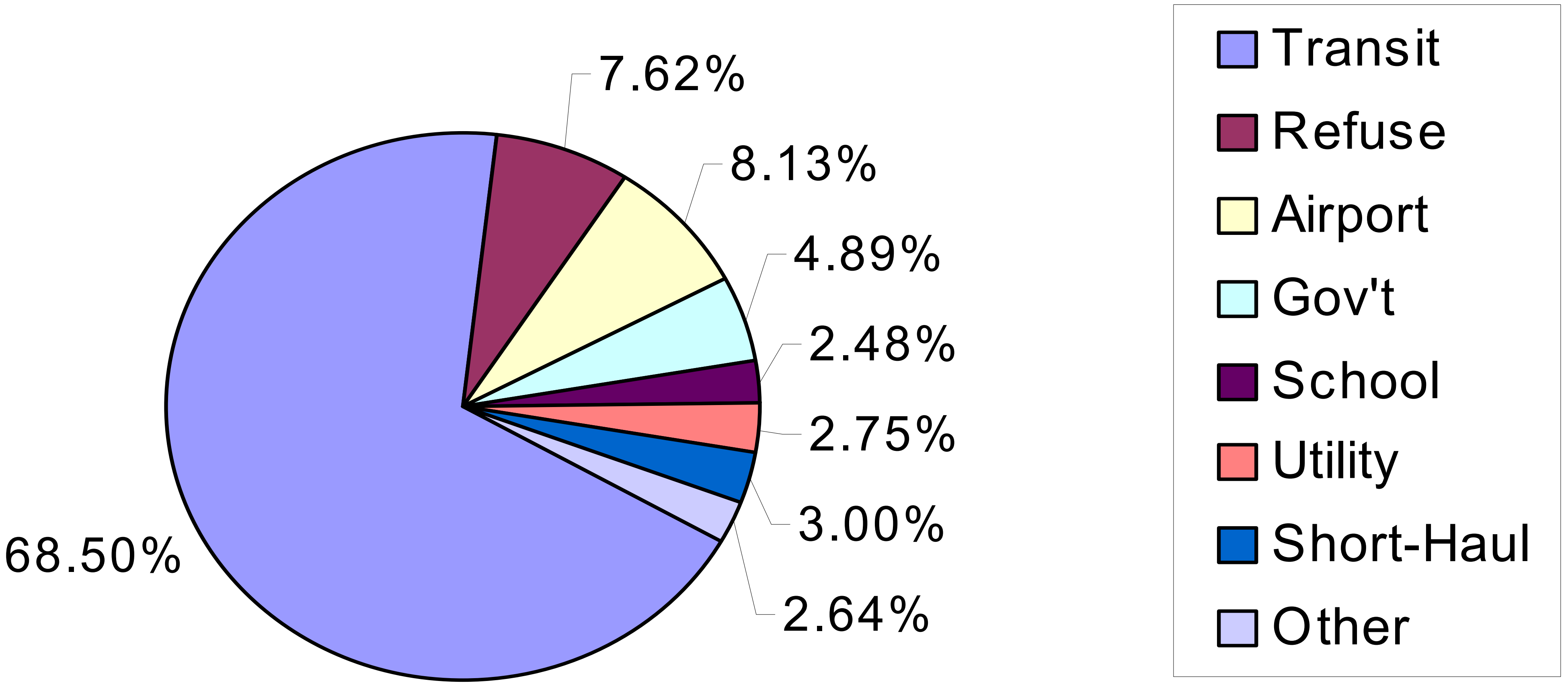
Summary of Data

- Fuel use has grown steadily
  - 2005 = 200 million GGE
  - LNG:40 million GGE (20%); CNG: 160 million GGE (80%)
  - MDV/HDVs up; attrition of LDVs (many bi-fuel)
- Historically, vehicle counts have been overestimated
- Inventory peaked at 105-110K in 2003, dropped to 92K by 2005 and now estimated at 85-90K
  - Exit of 3 OEMs, LDV life expectancy, Memo 1A Option 3

Summary of Data

- 90K NGV market composition in 2005:
  - 12-14K HDVs
    (8500-9000 transit, 1500 refuse, 2300 school bus, 1600-2000 in other public and private fleet applications)
  - 10-12K MDVs
    (airport shuttles, community transit, package delivery and other step-vans, miscellaneous PW trucks)
  - 66-70K LDVs

Vehicular Natural Gas by Niche Sector
US Total



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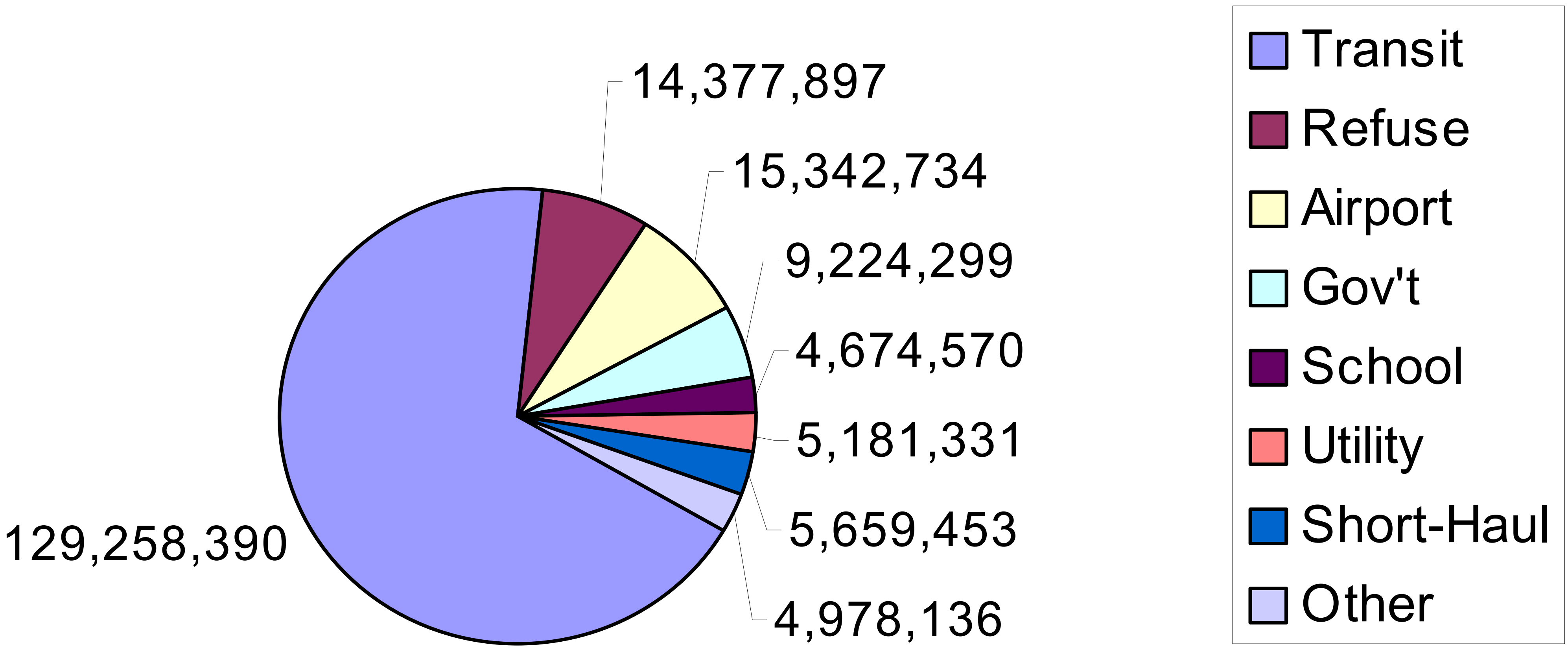
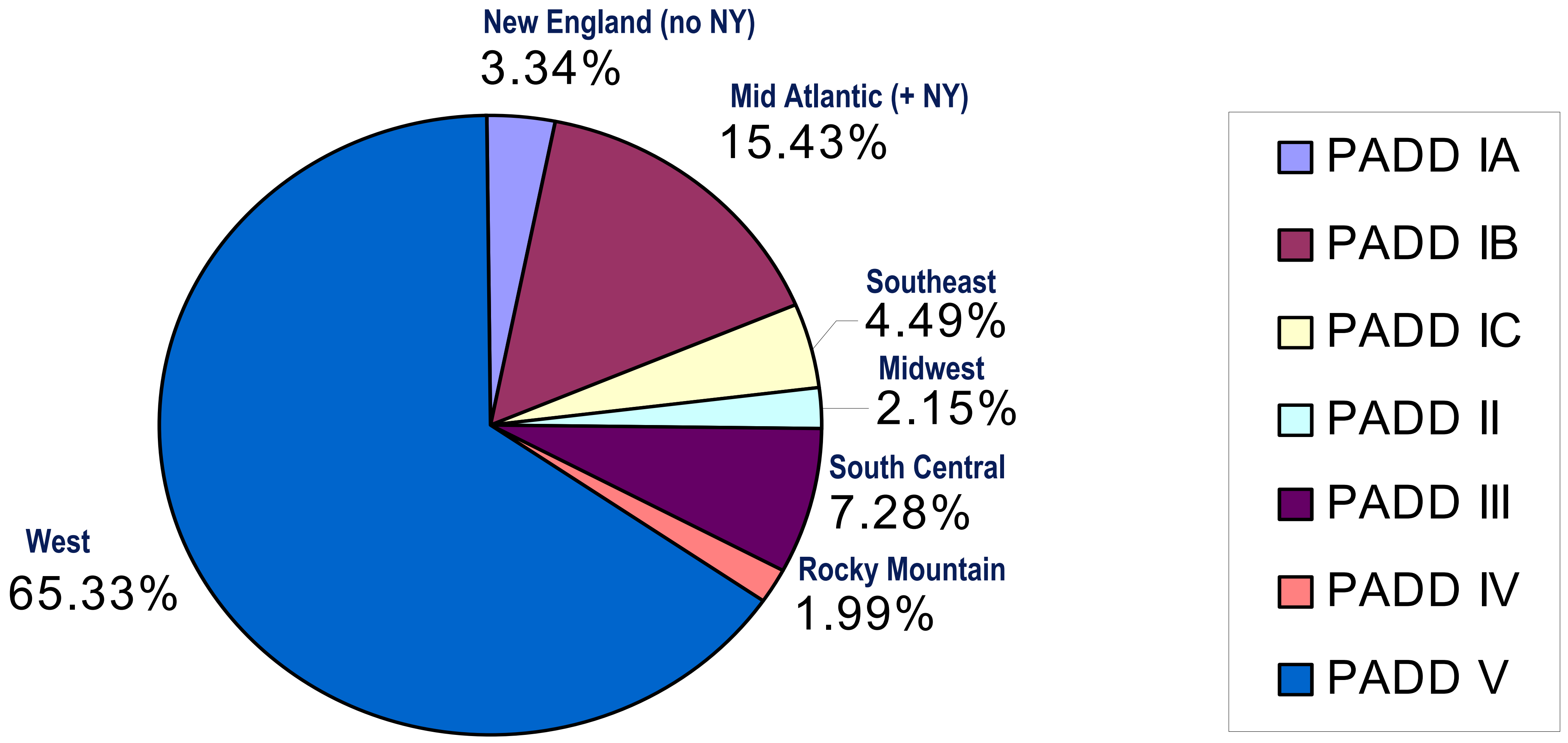
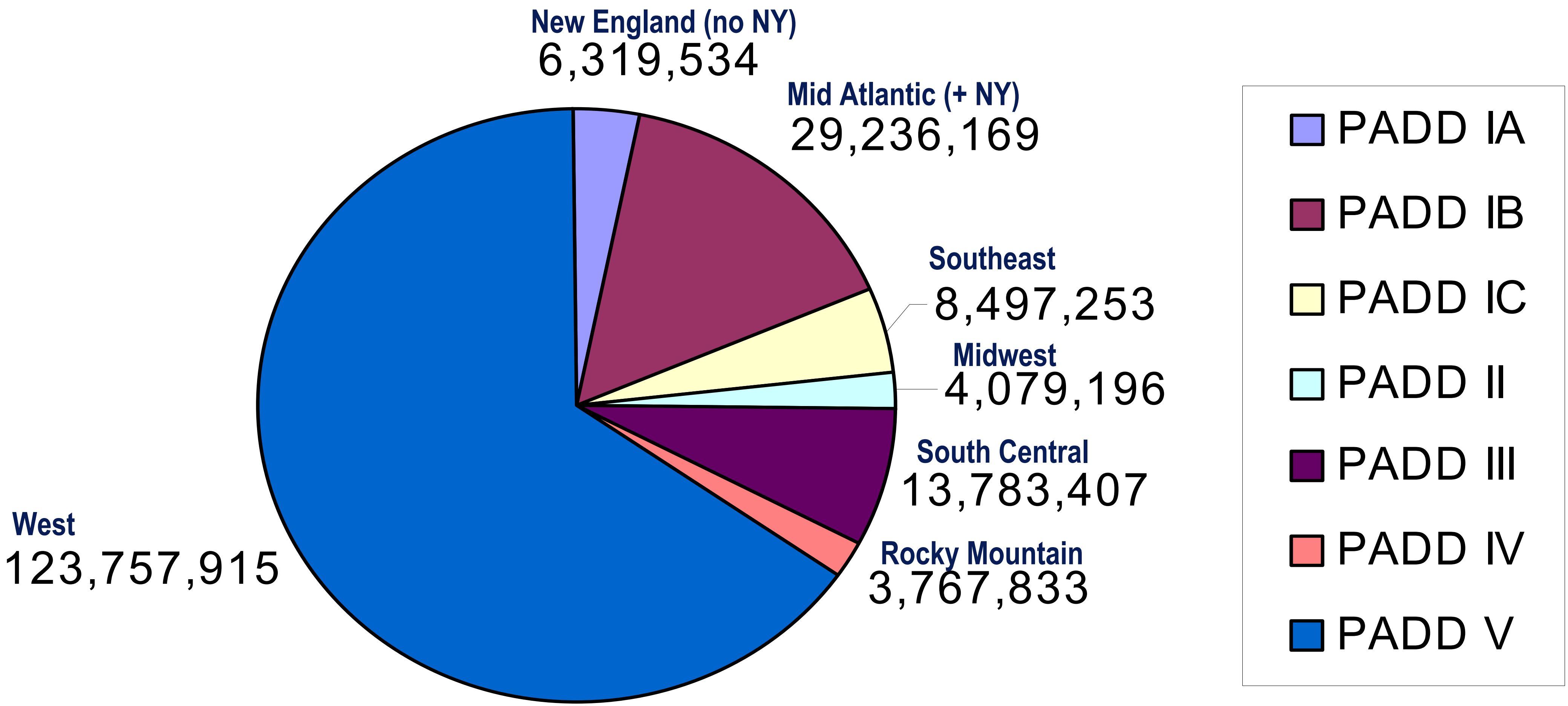
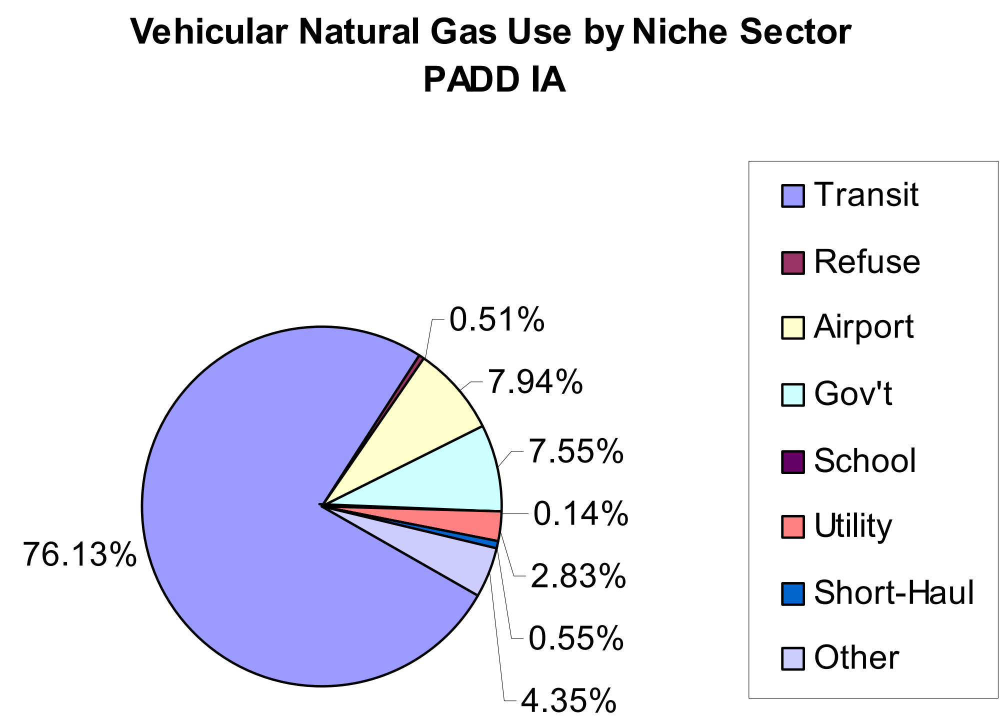


Vehicular Natural Gas Use by PADD



Vehicular Natural Gas Use by PADD

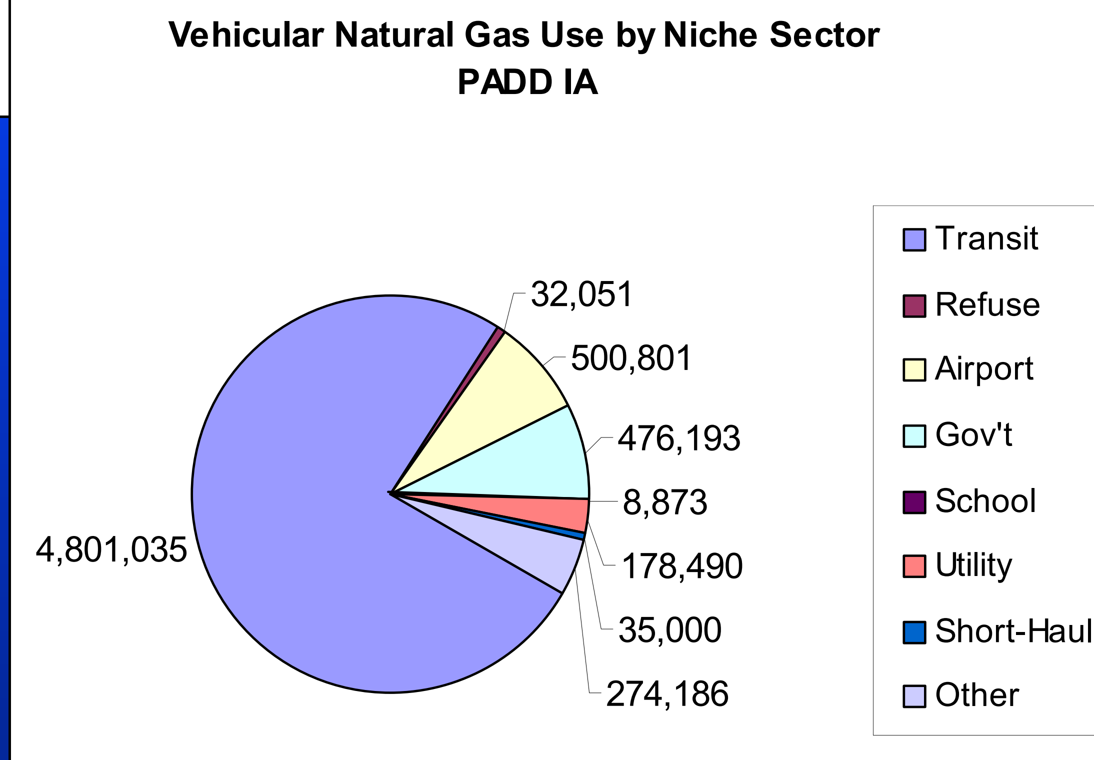


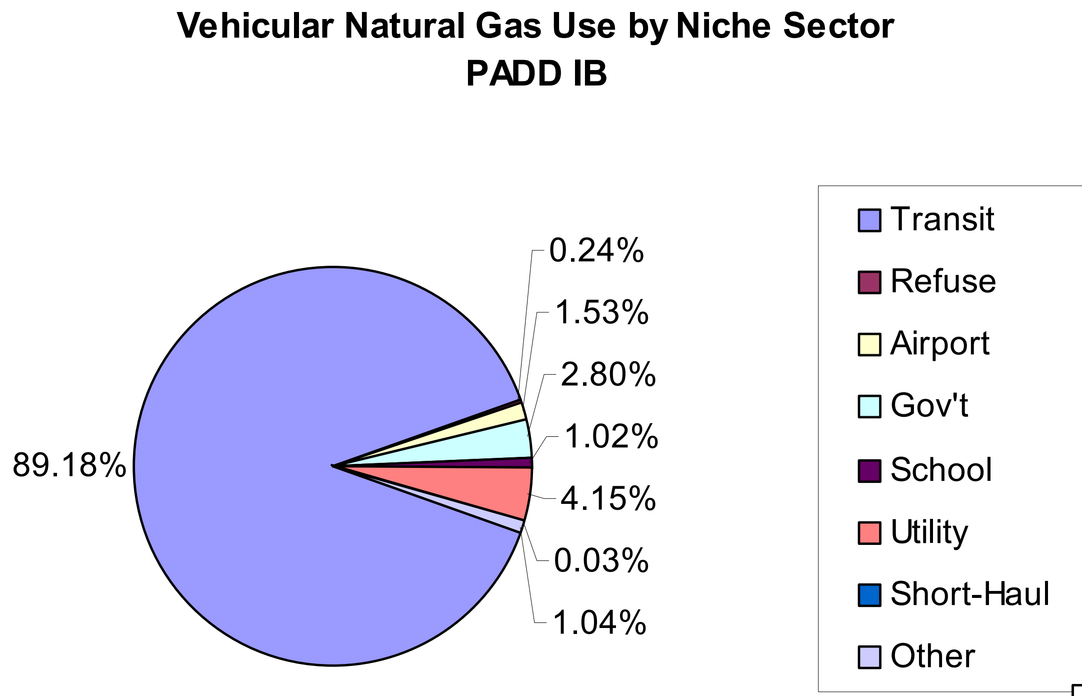


- Maine
- Vermont
- New Hampshire
- Massachusetts
- Rhode Island
- Connecticut

Highlights

- 6.32 million GGEs
- 3.33% of US
- MBTA = 4.5+ million

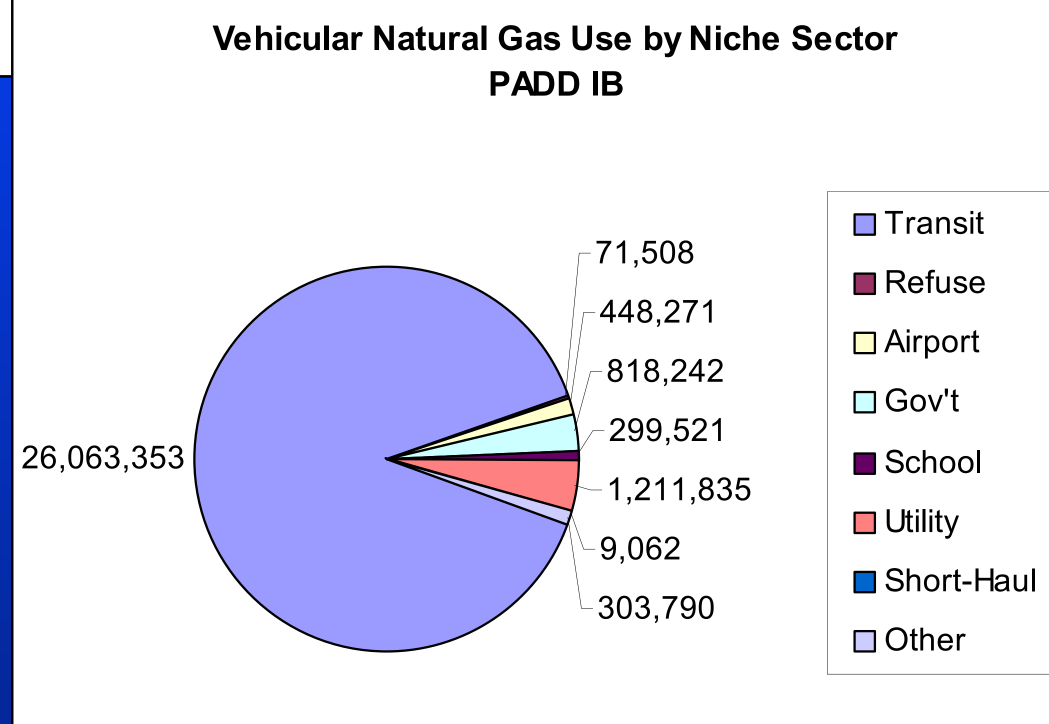




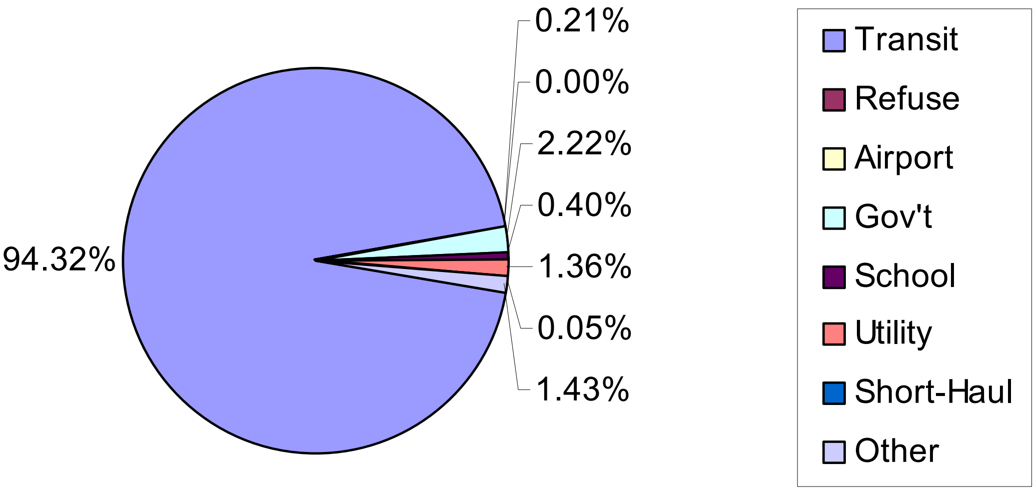
- New York
- New Jersey
- Pennsylvania
- Delaware
- Maryland
- District of Columbia

Highlights

- 29.24 million GGEs
- 15.43% of US
- NY ranks 2 – 11.2%



Vehicular Natural Gas Use by Niche Sector
PADD IC



- **West Virginia**
- **Virginia**
- **North Carolina**
- **South Carolina**
- **Georgia**
- **Florida**

Highlights

- **8.49 million GGEs**
- **4.49% of US**
- **MARTA in GA**

Vehicular Natural Gas Use by Niche Sector
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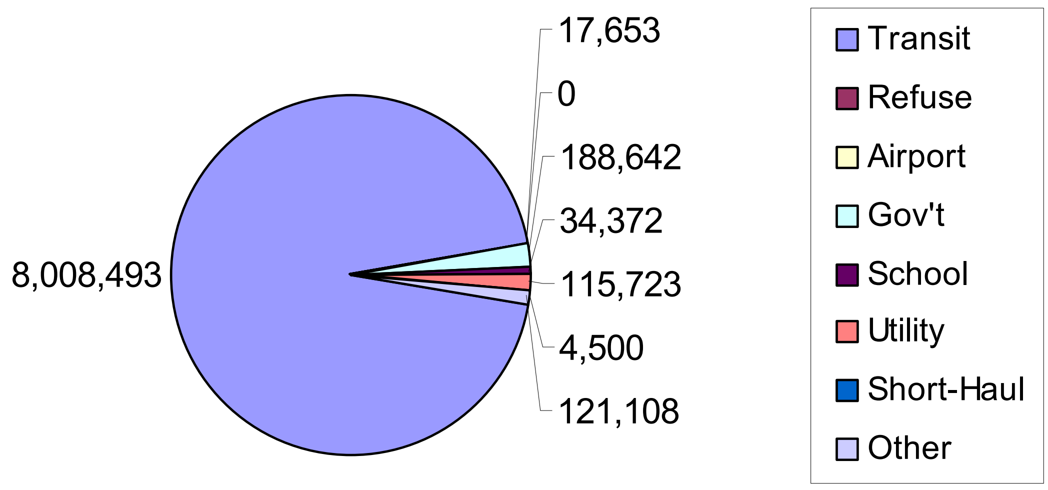
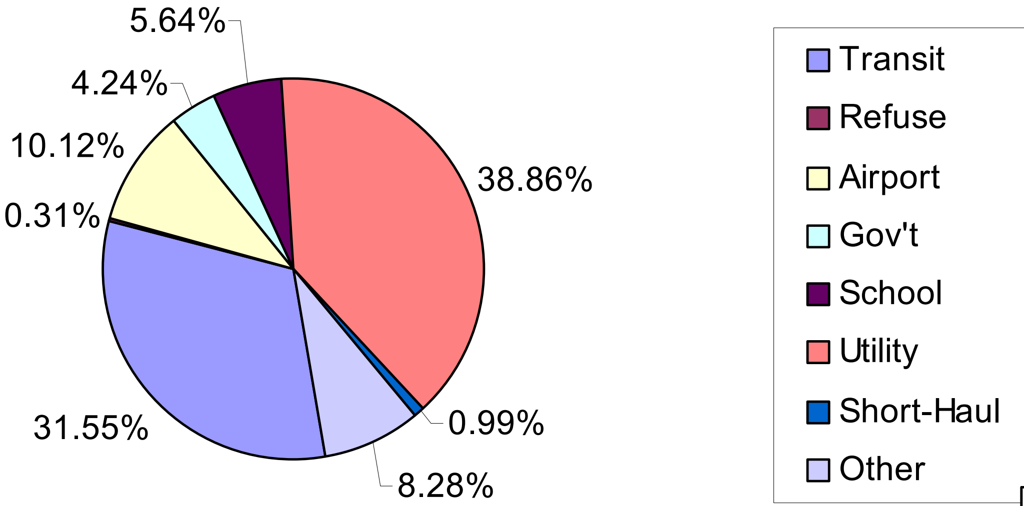


Vehicular Natural Gas Use by Niche Sector
PADD II



- Ohio
- Illinois
- Indiana
- Iowa
- Kansas
- Tennessee
- Kentucky
- Michigan
- Minnesota
- Wisconsin
- Missouri
- Nebraska
- Oklahoma
- South Dakota
- North Dakota

Highlights - Not Many

- 4.1 million GGEs
- 2.15% of US
- OK dominates region (ranks 4th in stations)
- Isolated Pockets: IN, MI, MO

Vehicular Natural Gas Use by Niche Sector
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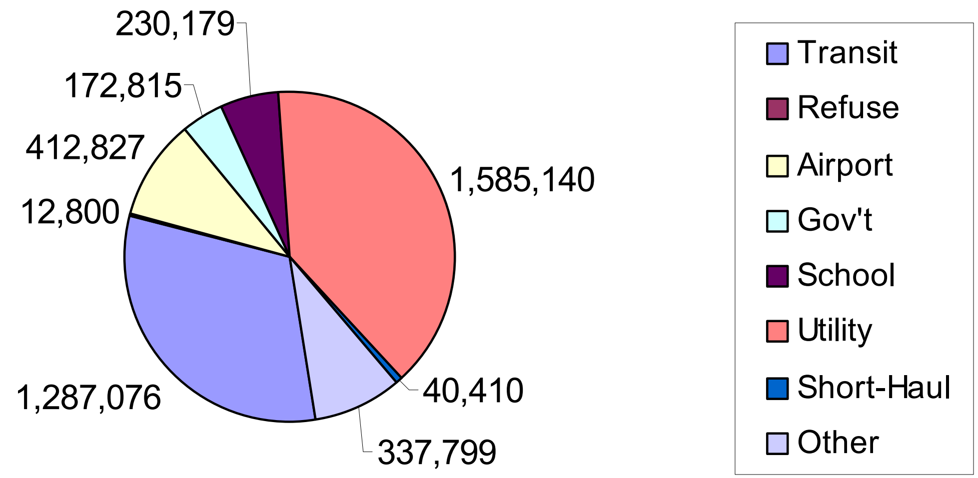
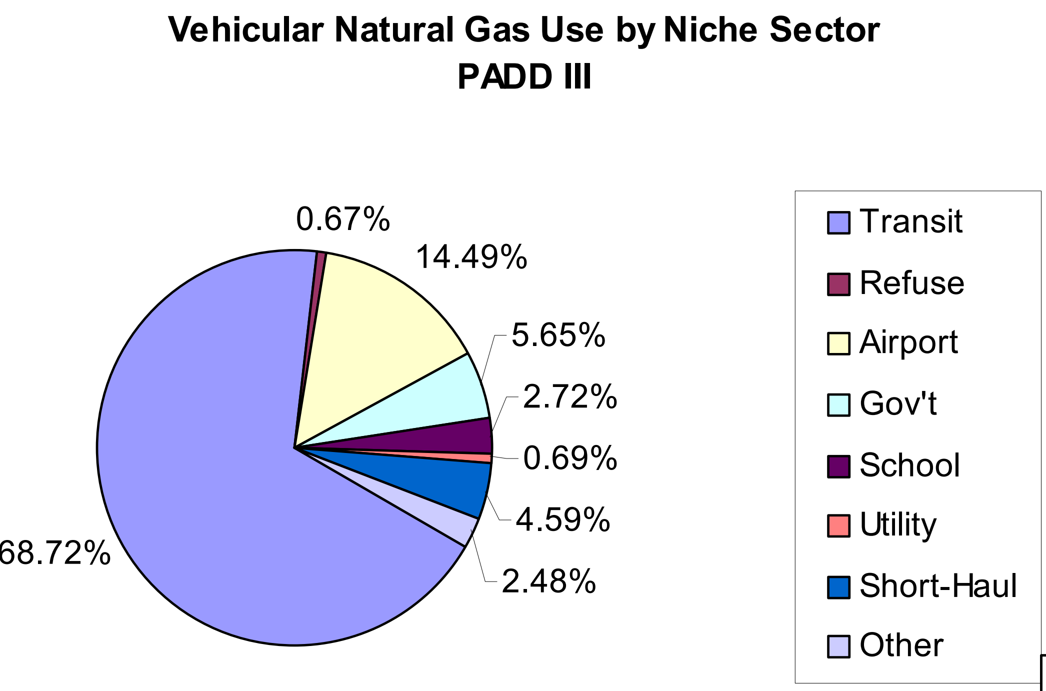
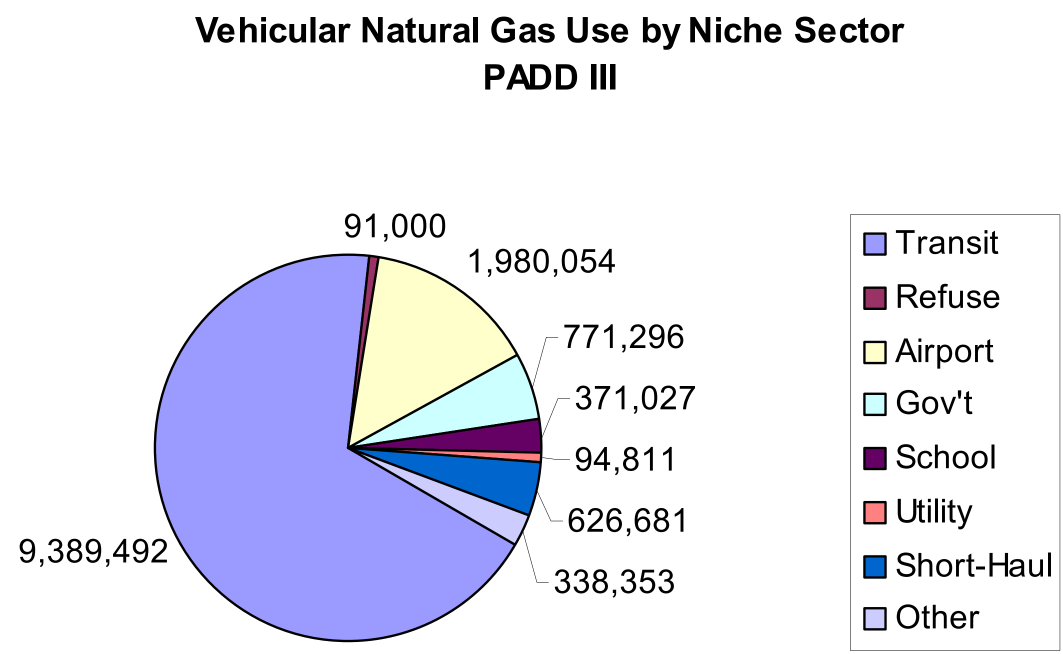




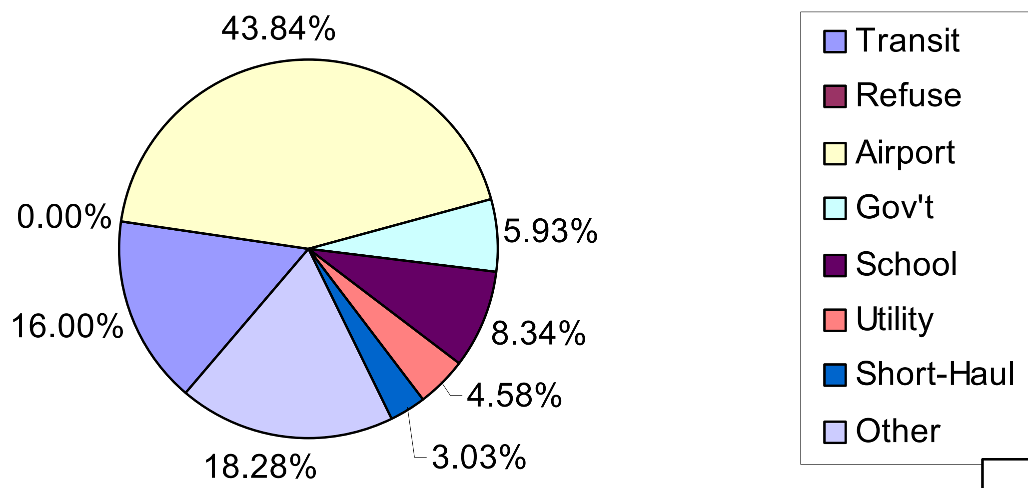
- Alabama
- Arkansas
- Louisiana
- Texas
- New Mexico
- Mississippi

Highlights

- 13.78 million GGEs
- 7.28% of US
- TX dominates (4th in US)
- Pockets: AL, LA, NM



Vehicular Natural Gas Use by Niche Sector
PADD IV

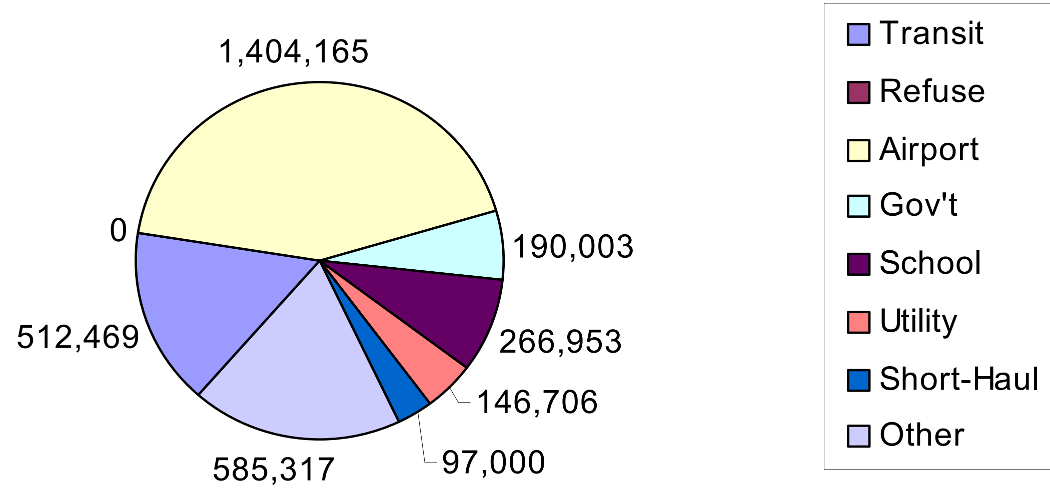


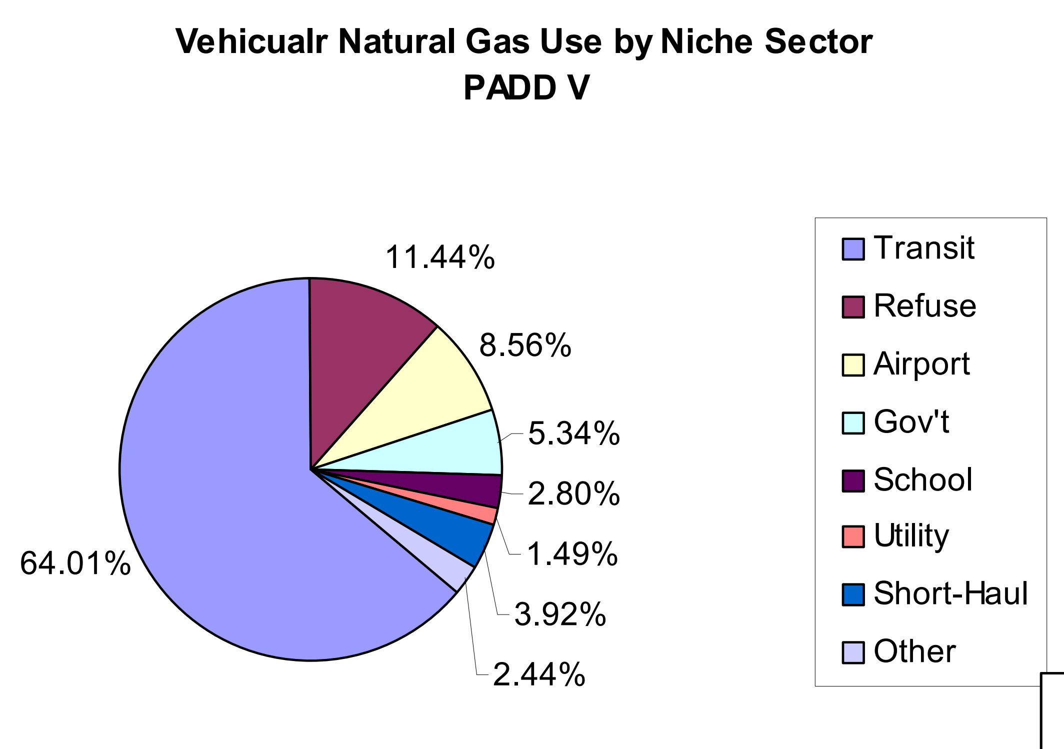
- Colorado
- Idaho
- Montana
- Wyoming
- Utah

Highlights

- 3.77 million GGEs
- 1.98% of US
- UT and CO airports
- UT station network (2nd in nation)

Vehicular Natural Gas Use by Niche Sector
PADD IV

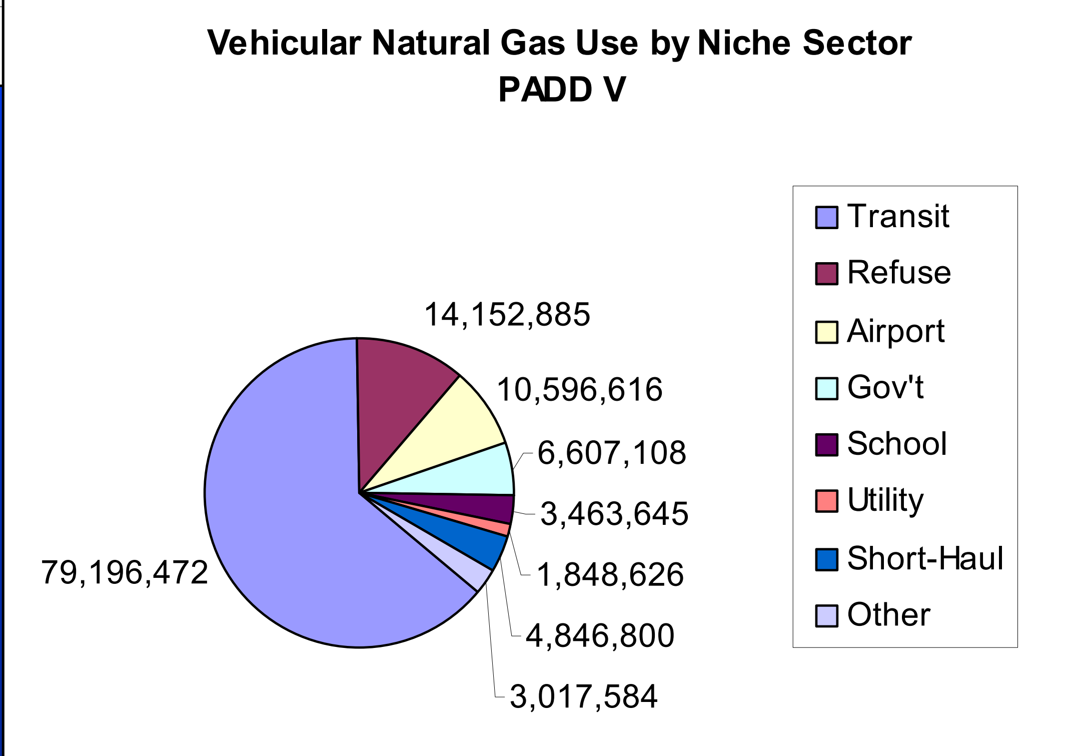




- Alaska
- Washington
- Oregon
- California
- Arizona
- Nevada
- Hawaii

Highlights

- 123.76 million GGEs (LNG = 27%)
- 65.33% of US
- California dominates
- Transit dominates but other sectors well represente
- 98% of refuse use in CA



Roadmap

History of NGV market growth divided into four periods

- 1965-1990
  Slow, steady growth driven by growing number of utilities – primarily for their own fleets but slowly commercializing technology with customers. Vehicle and station technology leaves a lot to be desired but burgeoning industry driven by discovery process and potential.
- 1990-1997
- 1997-2005
- 2005-2007

Roadmap

- 1965-1990
- 1990-1997
  Boom period for vehicle sales and station development driven by growing number of LDCs' (overly optimistic) expectations of market potential due to gov't mandates, new grants for transit sector, OEM engagement of technology and first factory-built LDVs
- 1997-2005
- 2005-2007

Roadmap

- 1965-1990
- 1990-1997
- 1997-2005
  Despite vehicle and station technology improvements, NGV market growth derails as federal mandates don't materialize, utility industry deregulation decimates market development programs, sluggish sales prompt several major OEMs to withdraw, EPA tightens emissions standards and certification requirements. Fueling infrastructure network starts to dwindle as market goes through "correction". Focus shifts from LDVs to HDVs/niche markets.
- 2005-2007

Roadmap

- 1965-1990
- 1990-1997
- 1997-2005
- 2005-2007
  Passage of Federal Tax Credits (albeit IRS is a bit slow on giving guidance)! Emissions regulations put the hurt on diesel ownership costs! Public awareness of oil dependence and alternative transportation options grows (although it's fixated on ethanol and hybrids)! Increasing number of OEM HDV options available! Favorable fuel price differential grows! … Now if we can just a get a few more feet on the street to work the market, we'll be in good shape…

Roadmap

- Summarizes Types of Stations,
  - Time-Fill, Fast Fill, Combination Fill capability
- Access
  - Private Access
  - Limited Public and Full Public Access
- Development, Ownership and Operations Options
  - Fleet O&O
  - Independent O&O (retail and "inside-the-fence")
  - Outsourced O&M

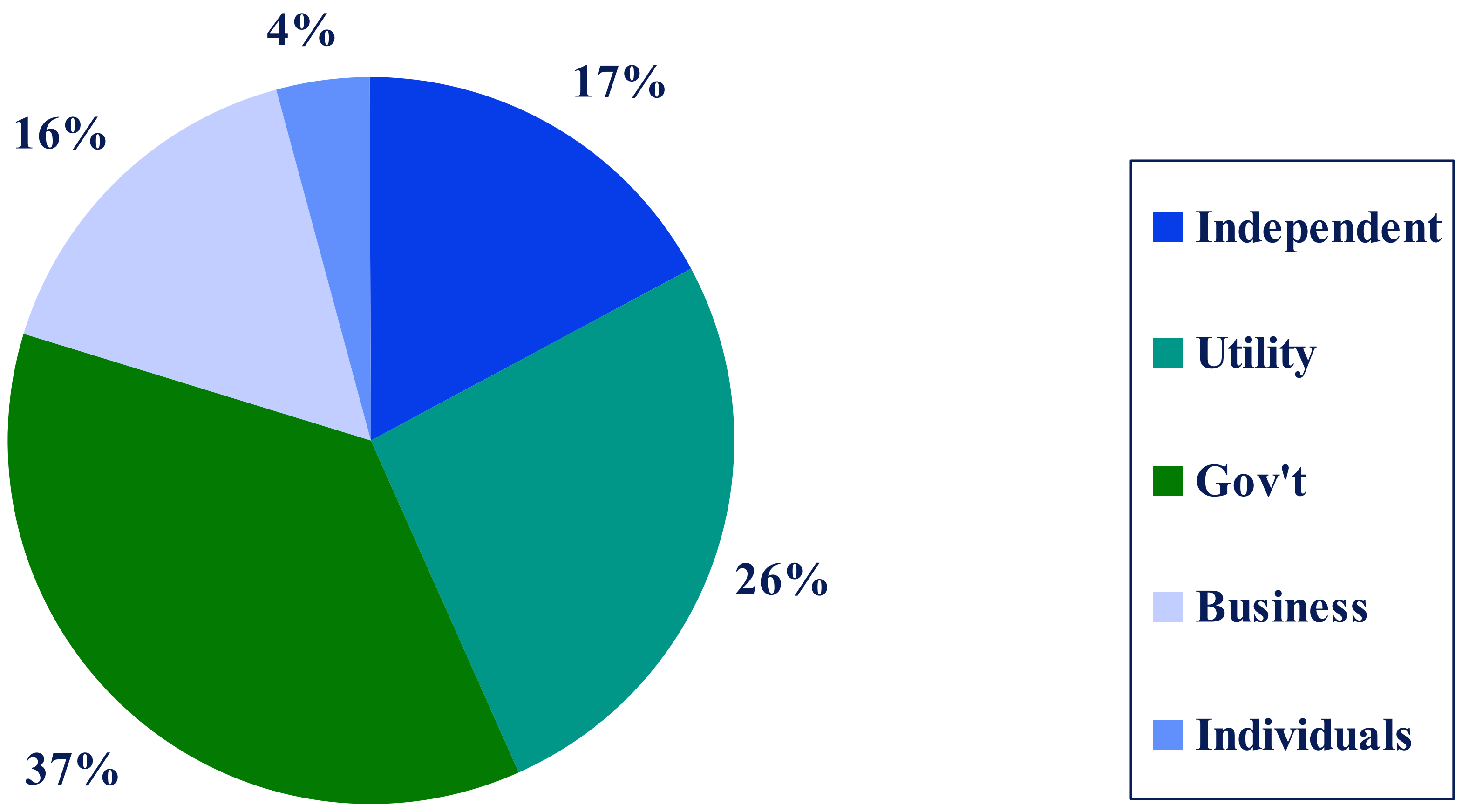
Roadmap

- Factors Affecting Fuel Infrastructure Development
  - Policy
    - Local/Regional AQ, Attainment Status, Carrots & Sticks
    - Energy Diversity Initiatives (Federal and State Govt's, PUCs)
  - Financial
    - Station Development (land, site dev, fueling equipment)
    - Fuel Price Differential
    - Availability of Grants, Tax Deductions/Credits
  - Logistical/Operational
    - Throughput, flow rates, storage, access/convenience, pmt processing, tax administration
    - O&M skill sets, training,

Roadmap

- Status of Current Fueling Infrastructure
  - Who owns and operates

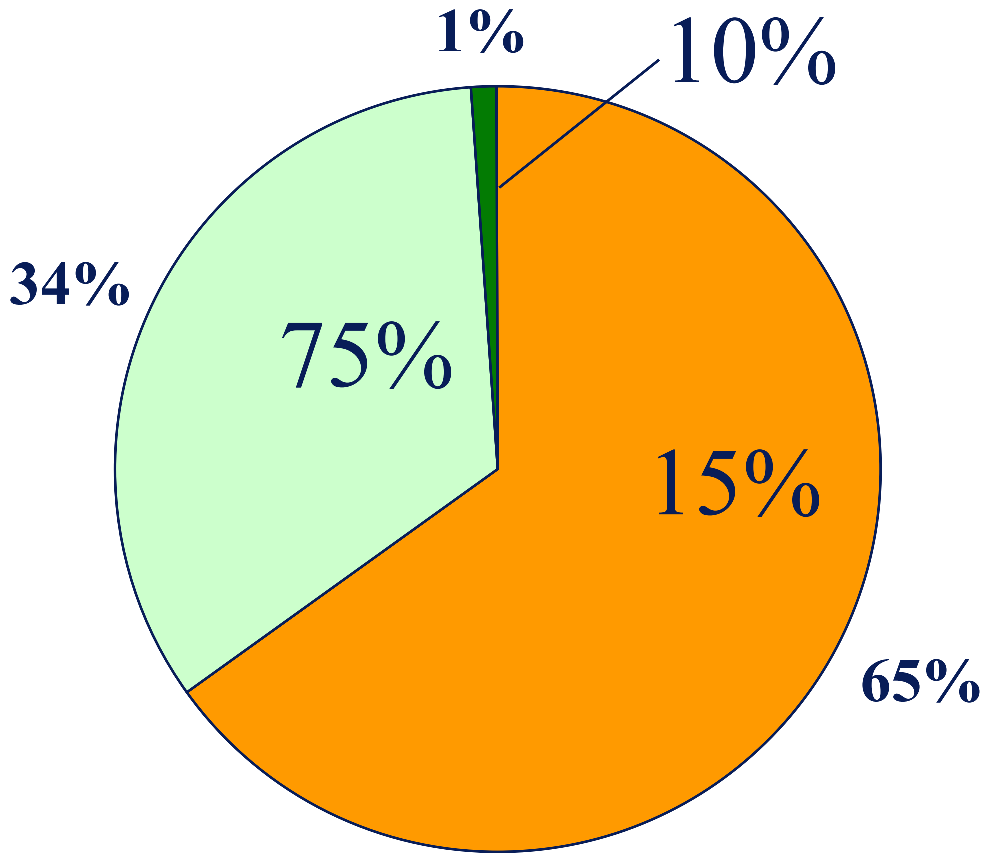
Who Owns and Operates?



Roadmap

- Status of Current Fueling Infrastructure
  - Who owns and operates
  - Which stations are pumping the fuel? What is the station utilization?

Where's the fuel being pumped?



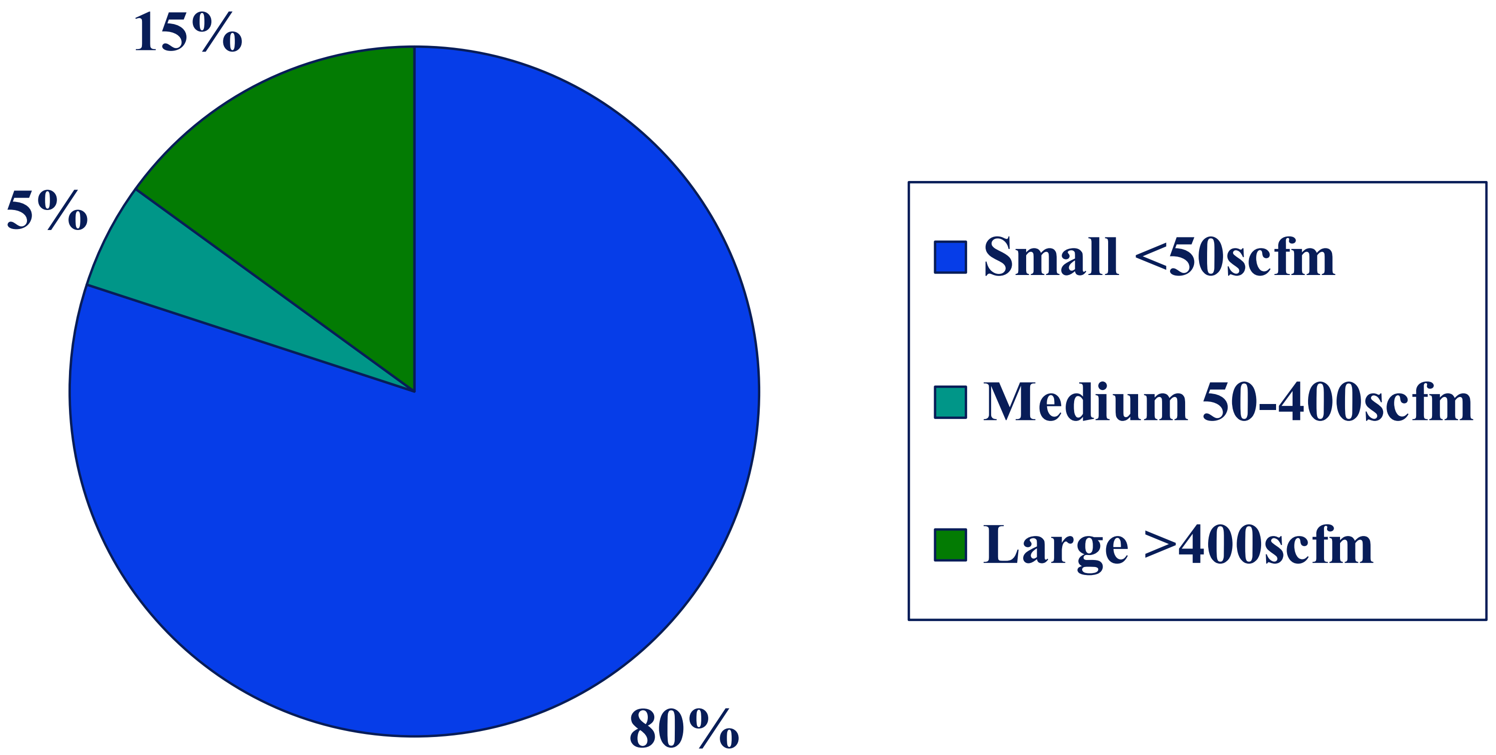
Roadmap

- Status of Current Fueling Infrastructure
  - Who owns and operates
  - Which stations are pumping the fuel? What is the station utilization?
  - The prospects for dormant and/or grossly underutilized stations
    - Many have minimal prospects for increased throughput.
    - Many are in need of significant investment to be viable
    - Additional attrition is likely as market continues “correction.”

Roadmap

- Station development, ownership and operation trends
  - New CNG station development
    - 90-110 new "stations" in 2004-2007

Station Development 2004-2007



25% were new stations for existing clients
60% were new stations for new clients
15% were new retail stations developed by independents

Roadmap

- Station development, ownership and operation trends
  - New CNG station development
  - Investments in existing CNG station infrastructure
    - Added capacity to existing CNG stations
    - Reinvigoration of underutilized stations

Roadmap

- Station development, ownership and operation trends
  - New CNG station development
  - Investments in existing CNG station infrastructure
  - Increasingly, independent station developers and equipment vendors take the lead
    - Many LDCs have exited or are sitting on sidelines
    - Limited number of independents plying the market

Roadmap

- Station development, ownership and operation trends
  - New CNG station development
  - Investments in existing CNG station infrastructure
  - Increasingly, independent station developers and equipment vendors take the lead
  - Heavy-duty fleets, larger stations get greatest effort
    - Vehicle availability, economics favor HDV niche markets
    - Small equipment package sales are dwindling w/o more OEM LDV options

Roadmap

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  - New CNG station development
  - Investments in existing CNG station infrastructure
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  - “Pooling” throughput:
    - Retail stations, anchor fleets and “outside-the-fence”

Recommendations

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- Extend tax credits to instill market confidence

Recommendations

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- Expand sales-marketing programs targeting medium-fuel-use fleets
- Provide added incentives for fleets that install outside-the-fence public access capability
- Expand current NGV stakeholder network

Questions/Comments?

Thank you