Natural Gas For Transportation: Prospects For Security And Environmental Benefits

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Natural Gas Based Fuels

- MIT Study on Future of Natural Gas considered both direct and indirect use:
  - CNG
  - LNG
  - Conversion to liquid fuels (particularly methanol)

- Emphasis on requirements for economic attractiveness
CNG

- Fuel cost savings  
  (gasoline- CNG price on energy basis)
- Incremental cost relative to  
gasoline or diesel engine vehicle
- Requirement for attractive payback time  
  (e.g. 3 yrs)

CNG: Near Term Market  
Potential And Impact
- High mileage/yr vehicle market segments  
- Short range, heavy duty vehicles  
- High mileage light duty vehicles (fleets)  
- Potential impact (100% market penetration)  
  - ~1.3 million barrels oil/day replaced  
    (using ~2.5 tcf/yr of nat gas)  
  - Reduce GHG from vehicles by  
    ~2% (25% CO2 reduction)  
    <2% when methane emissions included
LNG Long Haul Trucks

- Challenges
  - High incremental cost (e.g. $70,000)
  - Operational limitations of using super cold fuel (-162 degrees C)
  - Infrastructure requirements
  - Assurance of price competition between fuel suppliers
  - Reduced resale value

Hub to Hub Potential For Long Haul LNG Trucks

- Mitigates challenges
- Refueling at facilities owned by companies
- Potential impact (100% penetration)
  - Reduce oil consumption by ~0.4 million barrels/day (using ~0.8 tcf/yr of nat gas)
  - Reduce GHG emissions per truck by 10-15% (not including methane emissions from natural gas production – distribution)
Methanol Production Cost

- Natural gas @ $4/MMBTU:
  methanol produced for ~ $1.30/gge
  (~ $1.00/gge less than present gasoline price)

- Natural gas @ $6/MMBTU:
  methanol produced for ~ $1.60/gge

  gge- gasoline gallon equivalent
Methanol Powered Vehicles

- Light Duty
  - Tri-flex fuel (methanol, gasoline, ethanol)
  - Minimal extra cost ( $100- 200)
  - Open fuel standard
- Heavy Duty
  - Operation on methanol –gasoline mixtures
  - Lower vehicle cost than diesel
    ( $10-15,000 lower- less expensive exhaust treatment, less expensive fuel injectors)
  - Lower fuel cost (e.g $ 5,000 less per year)

Barriers

- Risk of building US natural gas to methanol conversion plants
- Aversion of automobile and oil companies
- Concerns raised about health and environmental effects
Summary

- Main potential benefit is improved energy security
- Modest potential impact of CNG and LNG. Impact limited by economic and operational issues
- Large potential energy security impact of methanol because of favorable economics/readiness for deployment