Improving Transportation Choices

Sketch Analysis of Measures for Addressing Travel Activity Patterns

presented to

Natural Resources Defense Council

presented by

Bill Cowart

NRDC
THE EARTH'S BEST DEFENSE

GHG Reduction Measures

- Fuel efficiency (mpg)
- Carbon content (alternative fuels)
- Travel activity (vehicle miles travelled)
- System performance (congestion)

- Emphasis of most GHG reduction efforts is on first two elements
- Travel activity needs further research
  - Effectiveness and costs
- System performance needs analytic development

NRDC
THE EARTH'S BEST DEFENSE

Greenhouse Gas Typology

- Greenhouse Gas (GHG) emissions =

  Travel activity (trips) *times*

  Person miles / trip *times*

  Vehicle miles / person mile *times*

  Gallons / vehicle mile *times*

  GHG / gallon

- This study focuses on first three elements, and also considers congestion effects on fuel efficiency

NRDC
THE EARTH'S BEST DEFENSE

Approach

- Explore “what if” travel activity was national priority
  - Intended to show the possible, not the likely
- Hypothetical policy scenario of aggressive national implementation of travel activity measures
  - Assumes full package applied throughout the country
  - Did not use national pricing/economic policies such as gas tax, carbon tax, VMT fees or cap-and-trade
- Feasibility is based on referencing best practices or aggressive implementation of measures currently in place
  - Simplistic assumption but appropriate for hypothetical approach

NRDC
THE EARTH'S BEST DEFENSE

Methodology

- Select travel activity measures
- Identify activity targeted by each (e.g., CBD, rural)
- Develop effectiveness factors for each measure (i.e., percent VMT reduction)
  - For many measures effectiveness was assigned *a priori* and measure defined such as to meet target (e.g., pricing levels adjust to achieve target)
  - Otherwise, medium to conservative values used
- Apply effectiveness factor to targeted VMT
- Nest measures to avoid double-counting

NRDC
THE EARTH'S BEST DEFENSE

Nesting

- Designed to avoid double-counting
- Apply effectiveness of measures targeted at smallest scale first (CBD commute VMT)
- Then apply at measures for next largest scale (CBD VMT) minus the reduction from CBD commute measures
- Continue up each level: CBD Commute, CBD, Urban Commute, Urban Expressway, Urban (Rural), National

NRDC
THE EARTH'S BEST DEFENSE

Measures

- Selected 24 measures – 21 currently implemented in U.S.
- Applied best practice (most aggressive existing implementation; highest effectiveness rate) nationally
- Measures phased in generally over 10-20 years
  - Pricing and commuter choice faster implementation
  - Land use, transit, parking pricing gradually increase through 2050
- Did not directly address feasibility
- Did not examine costs – varies widely from revenue generators (pricing) to quite expensive (transit investment, park-and-ride lots)

NRDC
THE EARTH'S BEST DEFENSE

Central Business Districts

- CBDs represent 5% of VMT in urban areas >500,000
- CBD commute trips are c.35% of total CBD VMT
- Parking freeze – defined as limiting new parking spaces so as to achieve:
  - Commute trips: -33% to target VMT in 2030
  - Non-commute: -22% to target VMT in 2030
  - Weighted to disproportionally affect shorter trips
- Cordon pricing – to be priced so as to achieve a 20% reduction in CBD travel
  - Effectiveness achieved in London and Stockholm; Singapore is higher

NRDC
THE EARTH'S BEST DEFENSE

Urban commute trips

- Includes all urban areas
  - Commute is about 18 percent of trips (conservative)
- Parking taxes: -3.1%
  - Commuter pay lots
  - Pricing of some free spaces
- Employer trip reduction programs: -1.0%
- Ride-matching, park-and-ride lots, and guaranteed ride home: -1.1%
- Telecommuting and compressed work week: -3.7%
  - Some studies show much higher potential

NRDC
THE EARTH'S BEST DEFENSE

Telecommuting example

- Aggressive commute reduction policies and/or economic incentives implemented to achieve:
- 2% additional penetration of full-time telecommuters
- 9% additional penetration of part-time telecommuters
  - Telecommute 30% of time (1.5 days/week)
- 50% discount to VMT reduction to account for increased discretionary trips, induced demand (research is mixed)
- Phased in from 2008 to 2020 (full effectiveness)
- Maximum effectiveness of 2.4% reduction applied from 2020 onwards

NRDC
THE EARTH'S BEST DEFENSE

Urban Areas

- Expressway congestion pricing: -2.0%
  - Prices will adjust to meet this target
- Speed limits and enforcement: -0.7%
  - Based on travel time elasticities
- HOV lanes: -2.7%
  - Travel time elasticities and DC/SF results
- Landuse – 3Ds and NMT: -11.6%
  - Consensus from multiple studies
- Parking policies: -1.9%
- Non-motorized zones: -0.5%

NRDC
THE EARTH'S BEST DEFENSE

Public transportation

- Baseline transit diversion: -2.9% urban vmt
  - Transit forecast to grow faster than vmt
- Double new starts/system expansion from baseline trend: -0.8%
- Improve transit travel times: -0.5%
  - Technology, BRT, headway benefits
- Improve transit frequency/headways: -1.0%
- Reflects effects of direct transit investment, not mode shift from other measures (to avoid double-counting)
- Costs should be a consideration

NRDC
THE EARTH'S BEST DEFENSE

Rural and universal measures

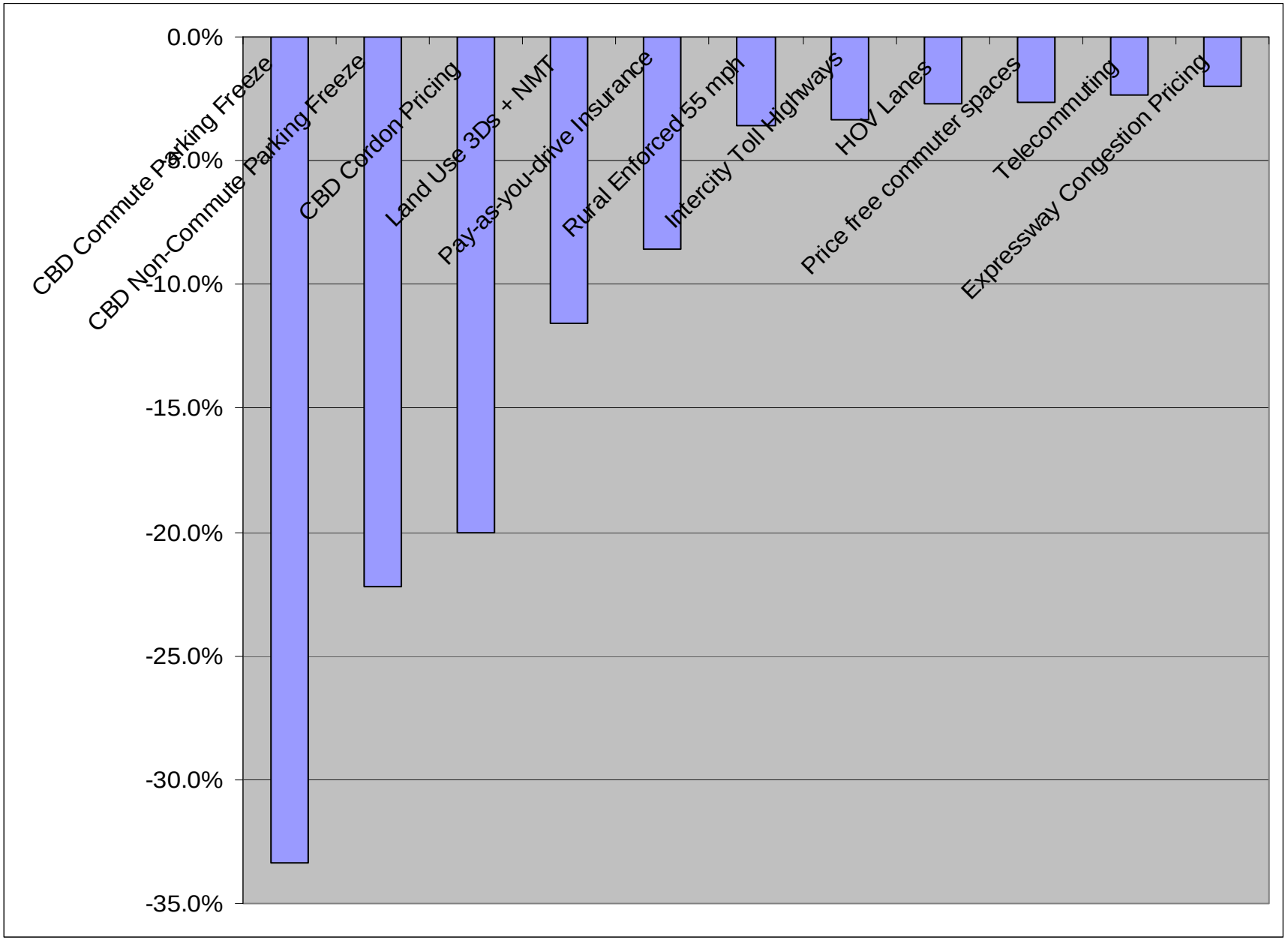
- Intercity tolls: -3.3% of rural VMT
  - Tolls set to achieve target
- Enforced 55 mph: -3.6%
  - Mode shift and trip chaining

Universal measure:

- Pay-as-you-drive insurance: -4.0% to -8.6%
  - $0.06 per mile charge, fully adopted

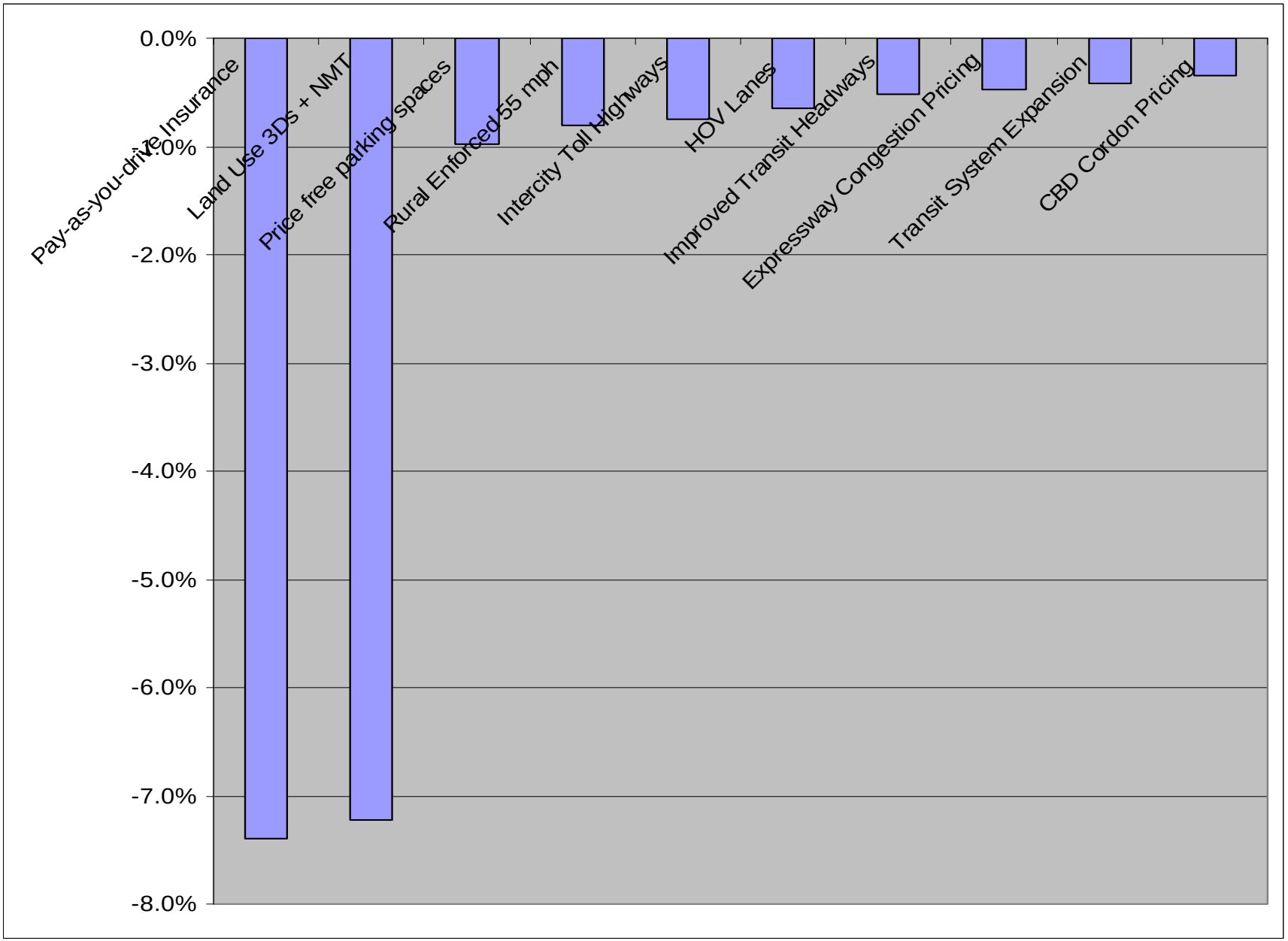
NRDC
THE EARTH'S BEST DEFENSE

Effectiveness vs. Target VMT



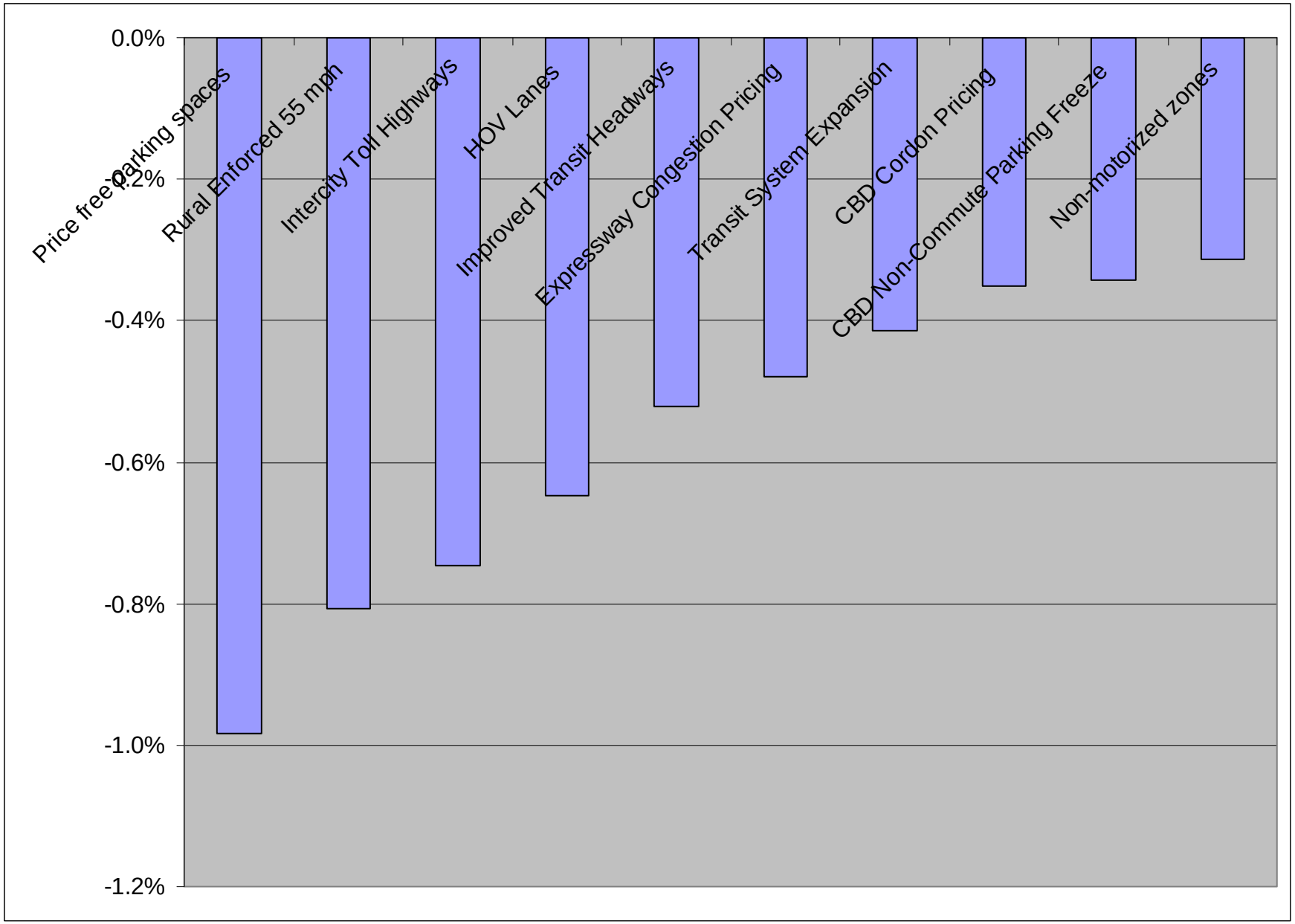
NRDC
THE EARTH'S BEST DEFENSE

Effectiveness vs. National VMT



NRDC
THE EARTH'S BEST DEFENSE

Effectiveness vs. National VMT



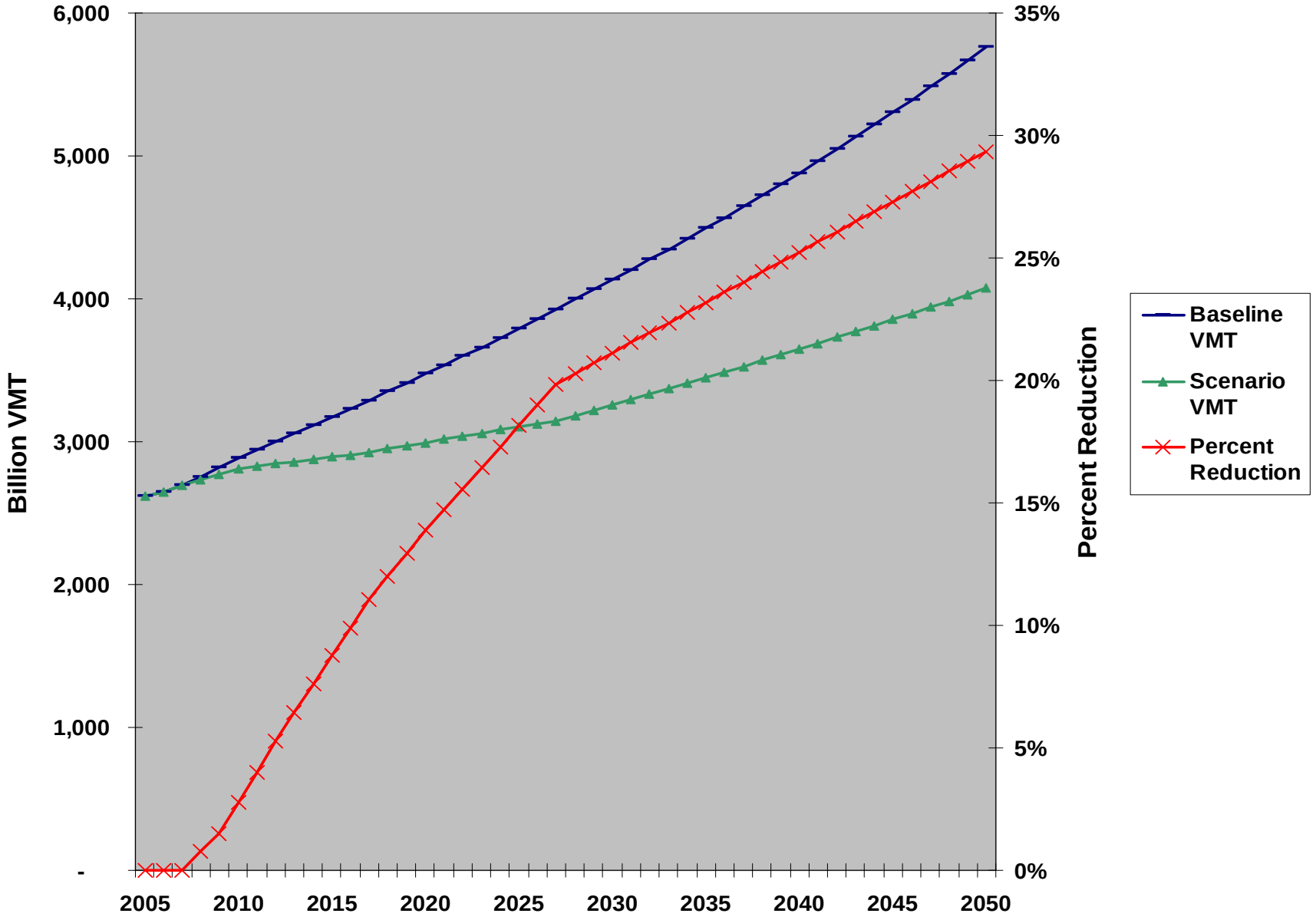
NRDC
THE EARTH'S BEST DEFENSE

Congestion and Induced Demand

- Congestion reduction can significantly improve fuel economy
  - From all urban VMT reductions (congested VMT)
  - Additional benefits from congestion pricing
  - Simplistic method used
- Induced demand created by congestion reduction/ improved highway speeds from VMT reductions
  - Counteracts 50% of VMT reduction where applicable: congested travel only
  - Not applied to congestion pricing, parking freezes, speed limits, telecommuting and compressed work week (already applied), rural measures

NRDC
THE EARTH'S BEST DEFENSE

Summary VMT Results



Summary VMT Results

- With aggressive implementation of broad package of TDM measures, 22% reduction from baseline VMT is achievable by 2030
  - 2020: 14% VMT reduction from baseline
  - 2030: 21%
  - 2040: 25%
  - 2050: 29%
- Induced demand from reduced congestion largely accounted for by measures' with implementation set to reduction targets
  - 2030 estimate would be lowered to 18%
  - Estimates need refinement

NRDC
THE EARTH'S BEST DEFENSE

GHG Impacts

- GHG reduction is equivalent to VMT reduction, adjusted by:
  - Benefits from reduced congestion
  - Benefits from speed limits
  - Increased emissions from transit, air and rail diversion
  - Increased emissions from induced demand
- Net effect – 2030 GHG emissions reduced 23% (21%) versus 21% (18%) VMT reduction

NRDC
THE EARTH'S BEST DEFENSE

Next steps

- Identify additional measures
  - Traffic operations (e.g., signal synchronization)
  - National pricing measures: fuel tax, vmt fees
- Refine sketch analysis to produce better estimates of the effectiveness of measures
  - Address uncertainty and range of effectiveness
  - Better define scope of target VMT; disaggregate into different size urban areas
  - Provide wedge analysis of measures
  - Incorporate congestion and induced demand effects by individual measure rather than one size fits all

NRDC
THE EARTH'S BEST DEFENSE

Next steps (cont.)

- Address cost issues for measures
  - Cost-effectiveness ($/tonne; $/PMT)
  - Marginal abatement cost curves
- Further develop analysis of congestion
  - Extent of VMT effected
  - Fuel economy effects
- Develop induced demand effects with greater sophistication
  - Incorporate effect by individual measure

NRDC
THE EARTH'S BEST DEFENSE

Wrap-up

- Clarifying questions
- Comments
- Discussion

NRDC
THE EARTH'S BEST DEFENSE

Thank you!

Bill Cowart
Cambridge Systematics
301-347-9131
wcowart@camsys.com

NRDC
The Earth's Best Defense