School Bus Emission Reduction in New York City

Presenter: Timon Stasko

Academic Advisor: Oliver Gao

Professional Advisor: Mark Simon

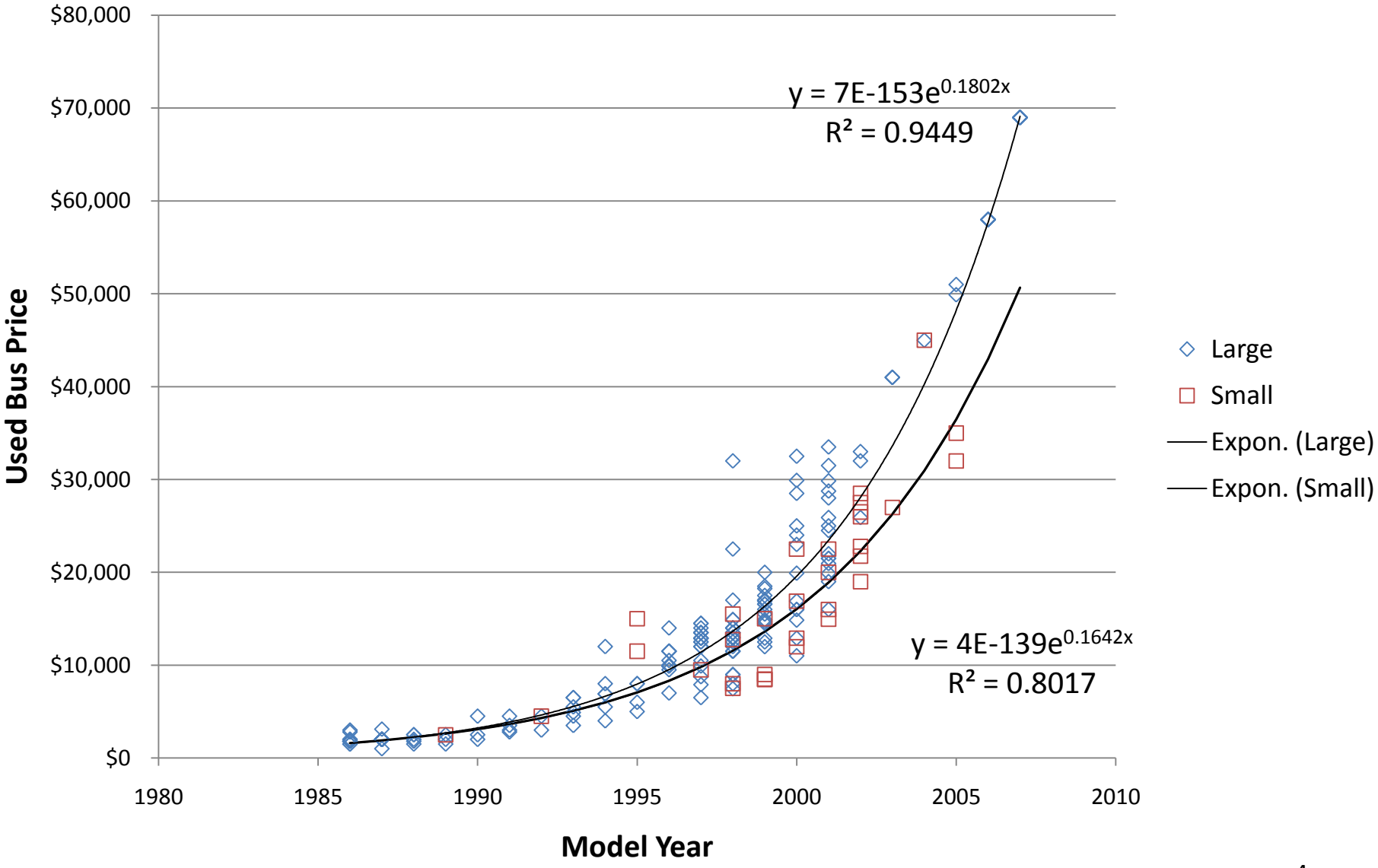
Considered Retrofit Options

- Diesel Oxidation Catalyst (DOC)
  - $2000 base cost, 3 hour install
- Passive Diesel Particulate Filter (PDPF)
  - $9000 base cost, 8 hour install
- Active Diesel Particulate Filter (ADPF)
  - $16000 base cost, 16 hour install
- 2008 Model Year Replacement

Cost of Replacement

- Cost = Used Bus Market Value – Scrap Value
- Scrap value of $700 for short, $1000 for long
- Used bus market values obtained from 100's of bus prices collected from public and private sellers

Used Bus Prices by Model Year and Size



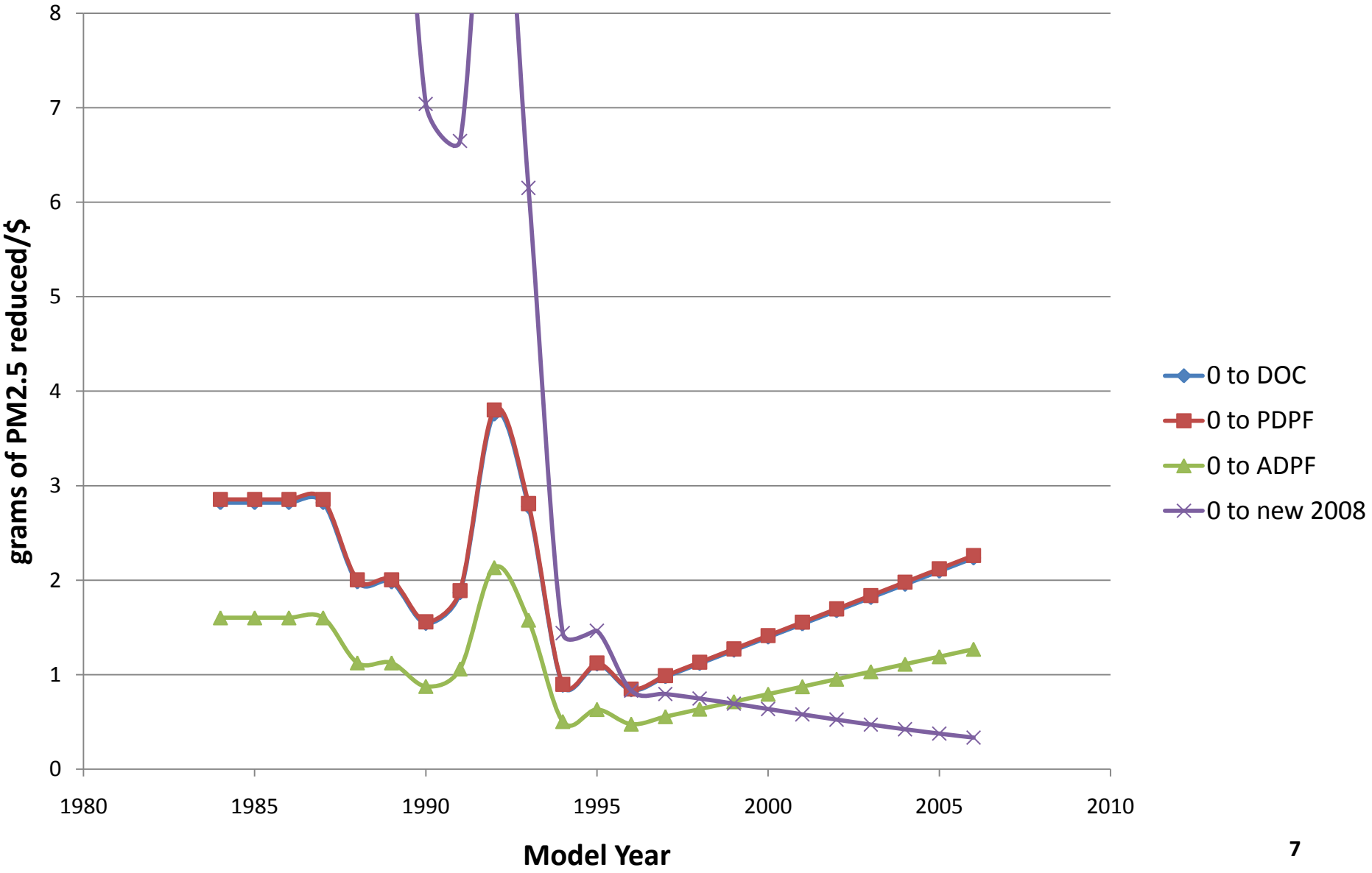
School Bus Usage

- MOBILE6.2 standard of 9939miles/year for school buses was used
- Additionally, 15min of idle time/school day was included
- Expected life of 19 years, 1 remaining year for those older than 19

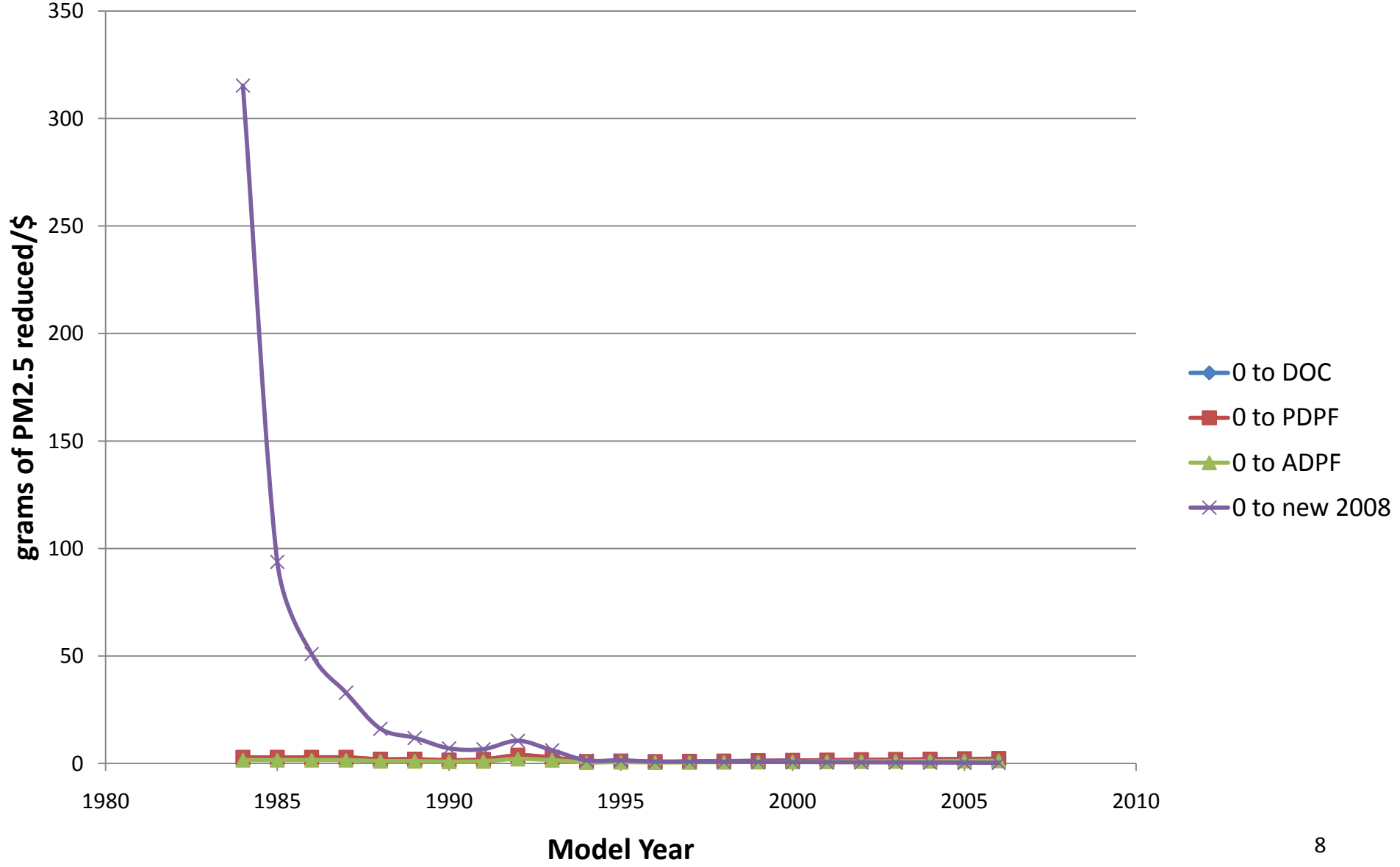
Emission Rates

- All emission rates are obtained from EPA MOBILE6.2 software
- Distinct PM2.5, CO, NOx, VOC g/mile and g/hr idle rates for each model year
- Gaseous idle emission rates are computed using EPA recommended 2.5mph speed
- % reductions from each retrofit from EPA verified technology list

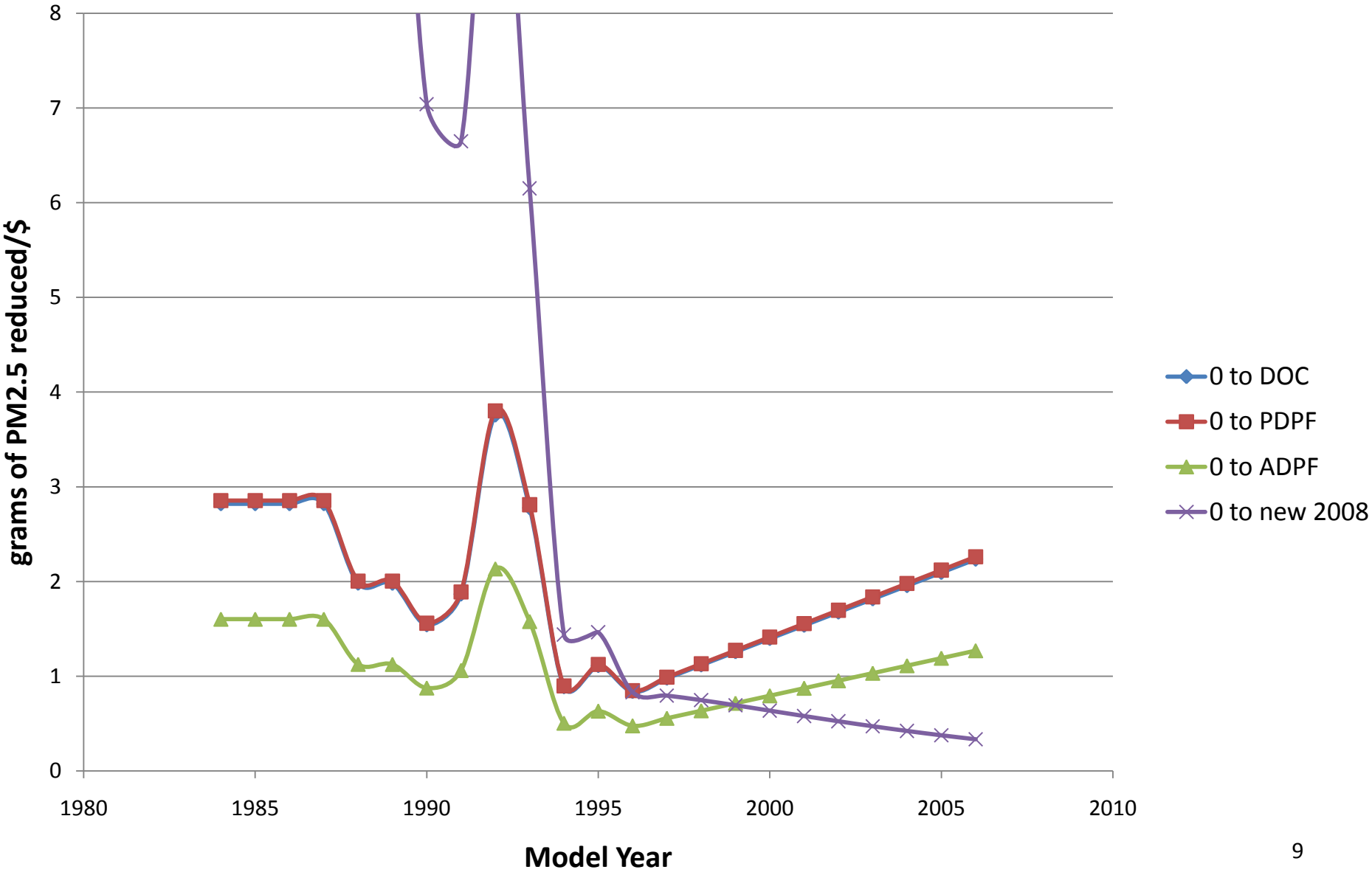
PM2.5 Reduction Cost Effectiveness for Large Buses



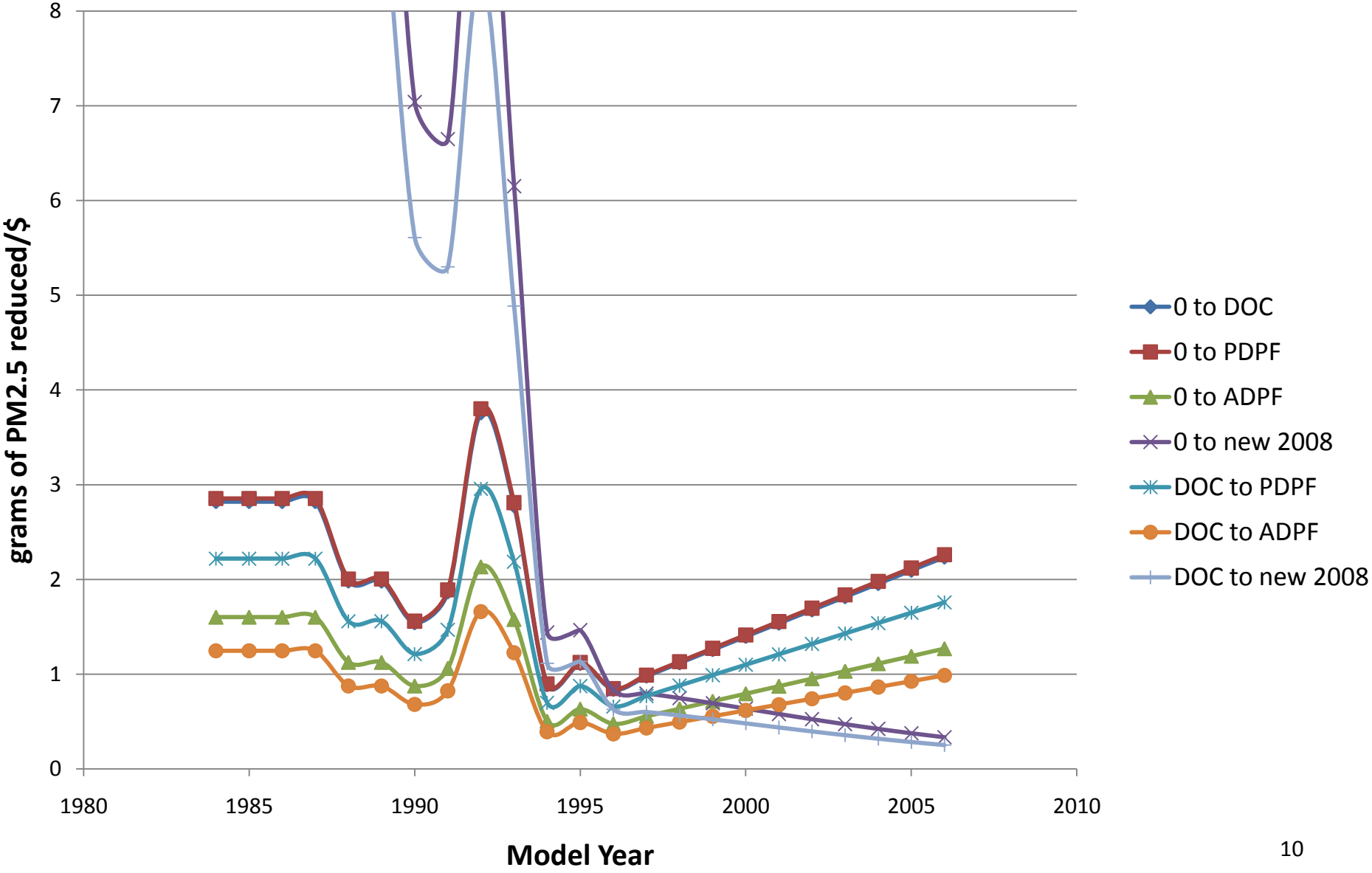
PM2.5 Reduction Cost Effectiveness for Large Buses



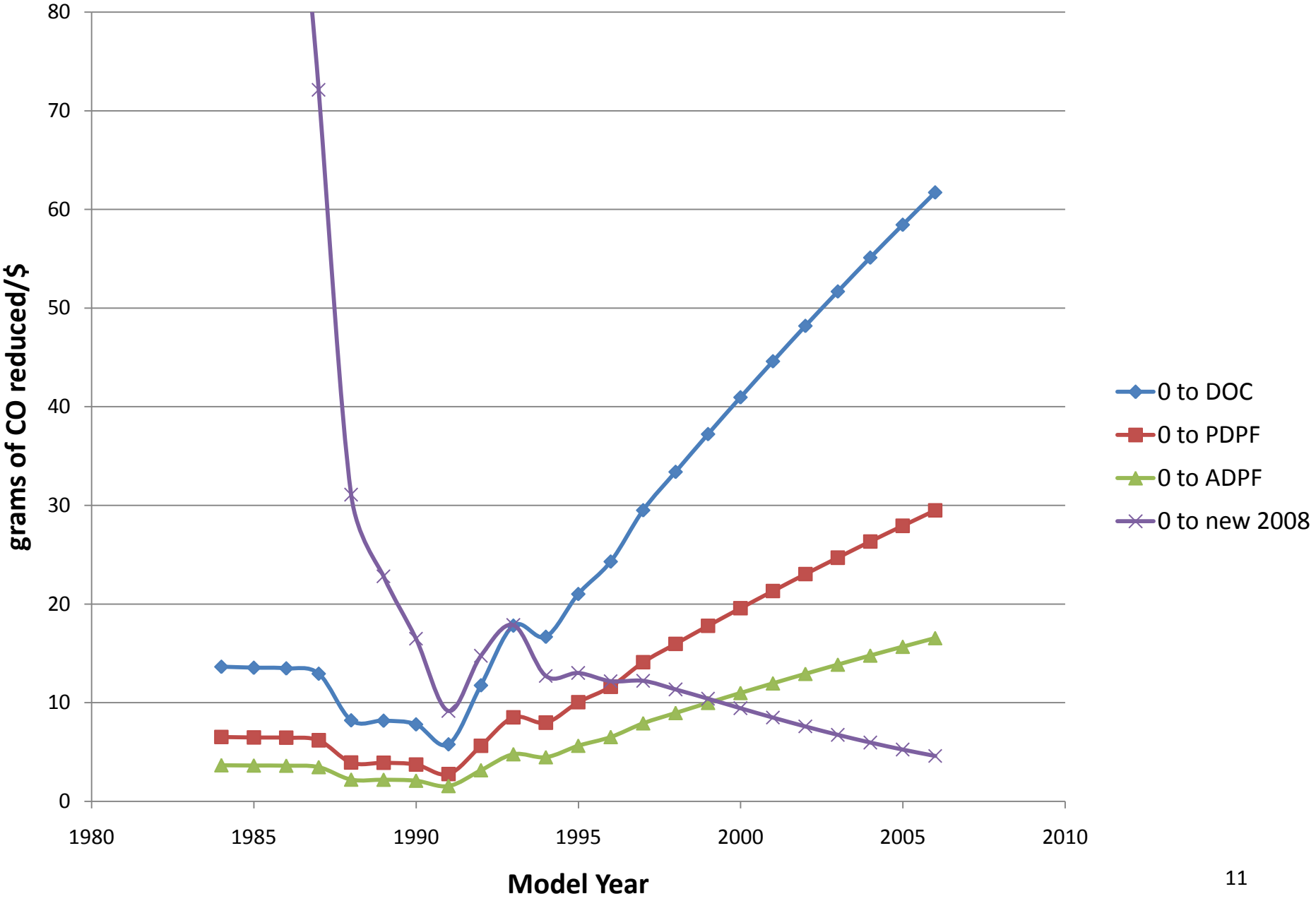
PM2.5 Reduction Cost Effectiveness for Large Buses



PM2.5 Reduction Cost Effectiveness for Large Buses



CO Reduction Cost Effectiveness for Large Buses



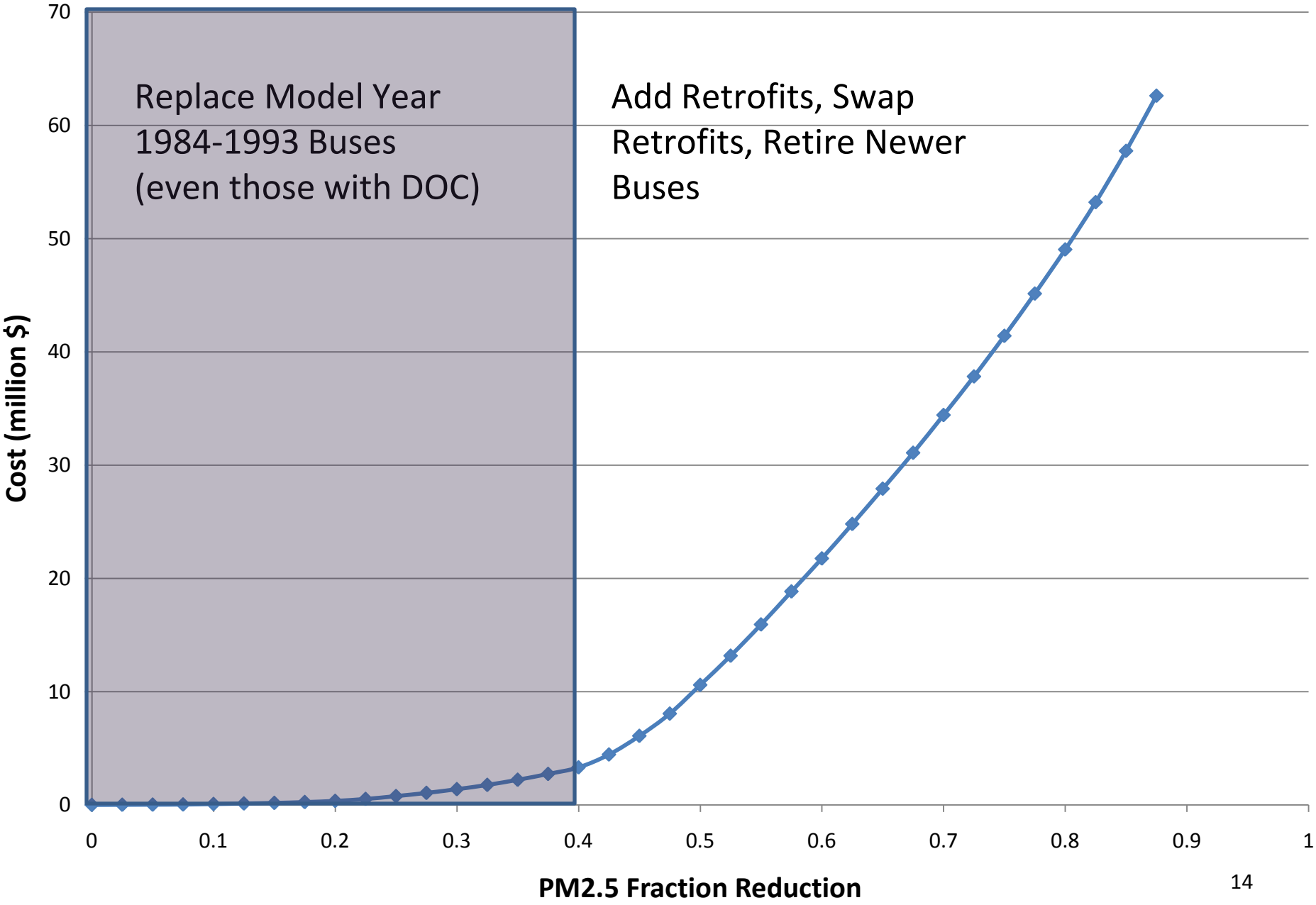
Trends in Cost Effectiveness

- Replacing the oldest buses is by far the most cost effective way to reduce all emissions
- For PM2.5, VOC , CO, and NOx, it is more cost effective to replace a pre-1991 bus than retrofit
- For PM2.5, VOC and CO, it is more cost effective to retrofit a post-1996 bus than replace
- Most cost efficient 1991-1996 strategy depends on bus size and priority of pollutants

Fleet Assumptions

- Limited information on past retrofits from meetings with planners, other sources
- PDPFs only possible on Staten Island
- MOBILE6.2 national average age distribution
- Resulting fleet is similar to NYC fleet in many ways, but is likely quite different in others

Cost vs. PM2.5 Fraction Reduction



Thank You

- Oliver Gao (Cornell University)
- Mark Simon (NYC DOT)
- Todd Goldman (UTRC)
- Penny Eickemeyer (UTRC)
- Kizzy Charles-Guzman (NYC Mayor’s Office)
- Eric Goldstein (NYC DOE)
- David Brzezinski (EPA)