Impacts of Deferred Investment on Capital and Operating Budgets

Executive Summary

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December 13, 2004

Purpose and Method

Purpose

- To illustrate how deferred capital investments impact the MTA’s capital and operating budgets.

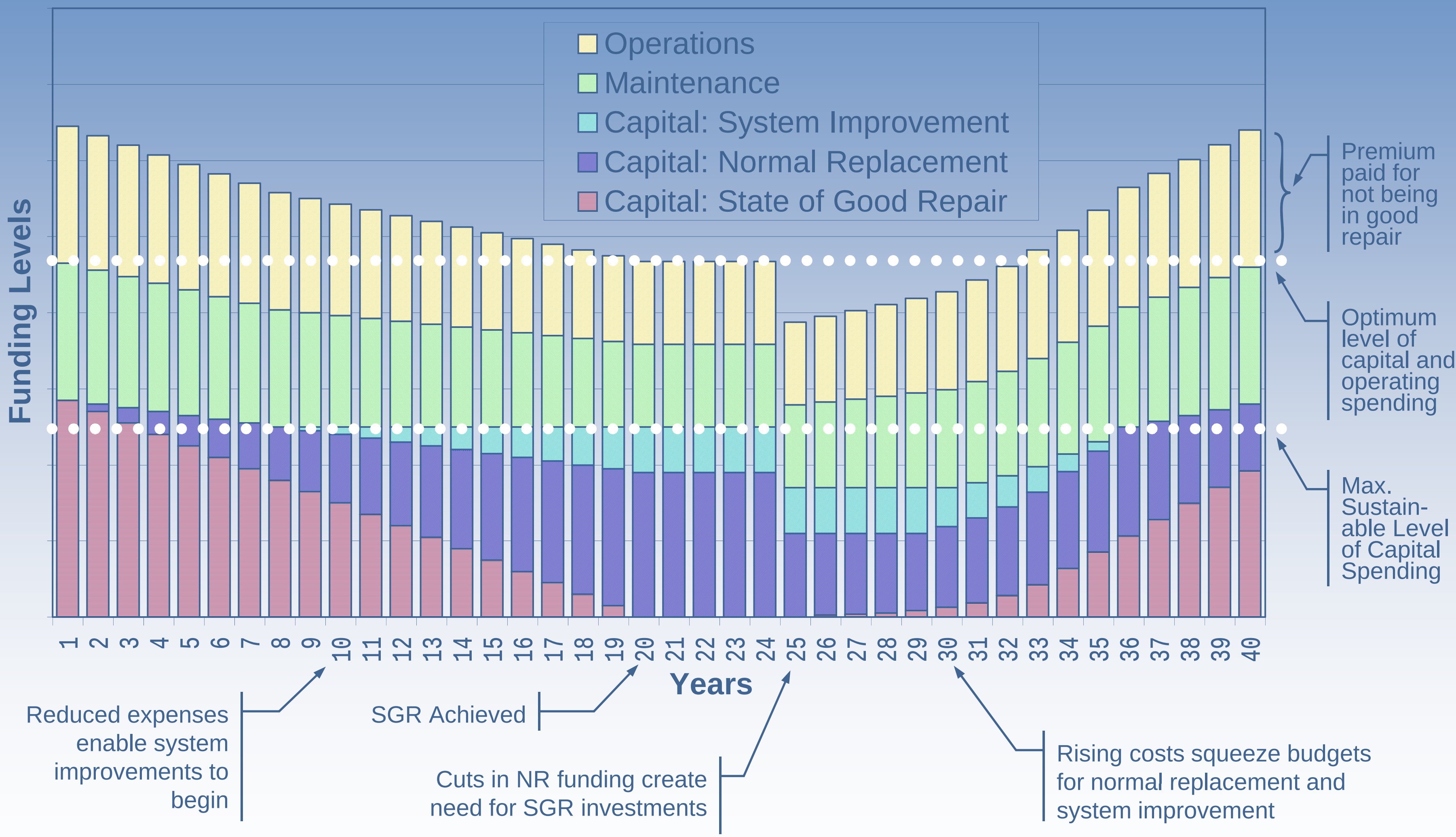
Methodology

- Met with agency capital planning staff to discuss purpose of the study and identify potential case studies.
- Analyzed proposed case studies to examine feasibility and data availability; sent further data requests.
- Discussed with maintenance, operations, and/or capital planning staff at each agency draft assumptions and conclusions for the case studies.
- Refined estimates and development of conclusions.

Deferred Capital Investment
Impacts on Operating and Capital Costs

- **"Reliability tax"** – Routine and emergency repairs become increasingly frequent as capital reinvestment is deferred *(e.g. bridge deck rehabilitation).*
- **"Efficiency tax"** – Work is needlessly complicated or resources wasted by obsolete facilities, equipment, and spatial constraints *(e.g. bus and rail car maintenance facilities and substation replacement).*
- **"Redundancy tax"** – Extra requirements for reserve capacity (larger fleet spare ratios, additional crews) are needed to keep the system operating at a given performance level *(e.g. rail car lifecycle maintenance).*
- **"Capital tax"** – The degree of disrepair accelerates over time, or repeated capital investments that otherwise might be avoided remain necessary *(e.g. bridge deck rehabilitation and concrete tie replacement).*
- **Cost escalation** – Inflationary pressures increase the cost of a project over time, even if there is no change in its scope. These costs typically grow slightly faster than the CPI. MTA's revenues do not necessarily grow as fast as CPI inflation, so even modest increases in "real" cost can impact the agency.

Deferred Capital Investment
Long-Term Impacts



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Case Studies

Results of Cost-Benefit Analyses

Project Name	Useful Life (Years)	Capital Cost ($M)	Scenario Tested	Budget Impact vs. Capital Cost
Railcar Lifecycle Maintenance Investments	25	$167.6	No Build	252%
Jamaica Bus Depot Replacement	100	$130.0	5-Yr Delay	23%
Cross Bay Bridge Deck Rehabilitation	50	$48.8	9-Yr Delay	547%
Verrazano Bridge Deck Replacement	50	$165.0	2-Yr Delay	57%
Commuter Rail Power Distribution	35	$207.9	5-Yr Delay	31%
Commuter Rail Concrete Tie Installation	50	$116.2	No Build	214%

These cases are not directly comparable, but illustrate that SGR and NR investments bring long-term savings across a variety of capital systems.

Railcar Lifecycle Maintenance
Key assumptions

Scenario Tested: Modify and outfit new and existing facilities to enable the transition to full a Lifecycle Maintenance Program vs. maintain existing practice

Key Assumptions:

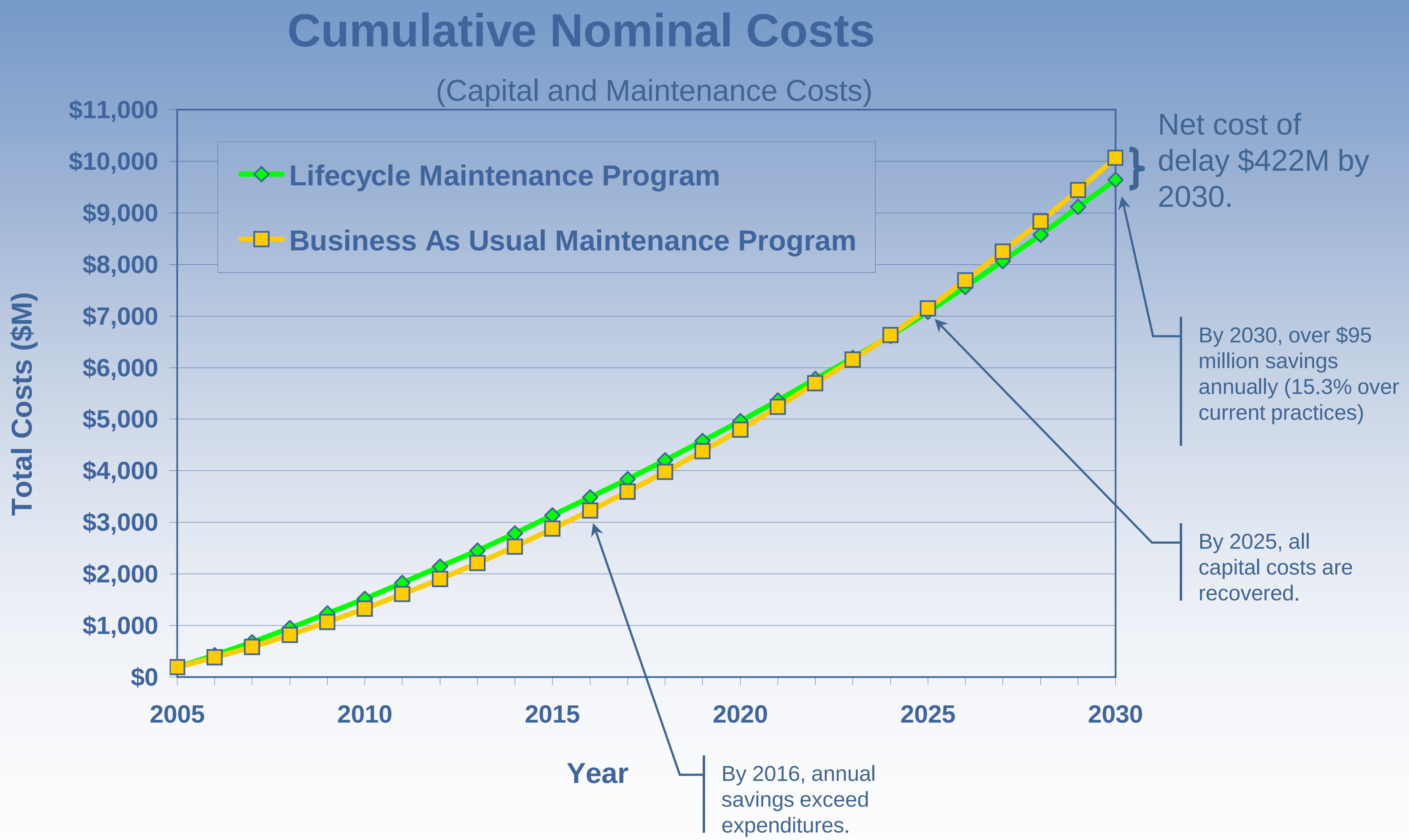
- Business-as-usual (BAU) assumes periodic inspection and maintenance costs are 80% of those under LCM; without LCM major costs increase 6% annually; other costs grow with inflation.
  - These BAU assumptions produce a net cost escalation of 3.9%. Historic LIRR cost escalation has been 5%, so these assumptions are conservative.
  - A sensitivity analysis was conducted on the assumed cost of major repairs.
- LCM scenario uses LIRR's detailed cost projections over 25 years.
- Worker availability and fringe benefits add 62% to the nominal cost of labor.
- LCM enables spare ratio to be reduced from 13.7% to 11.1%, resulting in a future fleet reduction of 32 cars for this study (a.k.a. the "redundancy tax").
- Not included: benefits from safer and better working conditions, more reliable service, and reduced need for train-moving crews.

Railcar Lifecycle Maintenance
Cost-benefit analysis results

Impact	Net Year-of-Expenditure Costs ($M)	Description
“Reliability Tax”	**$317.5**	Difference between higher unscheduled major repairs and lower scheduled maintenance.
“Efficiency Tax”	**$0.0**	
“Redundancy Tax”	**$249.0**	Capital and operating costs from larger fleet.
“Capital Tax”	**-$144.2**	Capital savings from not building new maintenance facility.
Cost Escalation	**$0.0**	
Net Budgetary Impact	**$422.2**	Net cost of business-as-usual scenario

- Although periodic inspection and maintenance costs are 20% higher, LCM saves on unscheduled major repairs and a lower spare ratio.
- The LCM capital investments yield savings of 252% of the capital cost.
- Including inflation and borrowing costs, investing now has a $35.6 million present value benefit (in 2005 dollars).

Railcar Lifecycle Maintenance
Cost-benefit analysis results



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Jamaica Bus Depot
Key assumptions

Scenario Tested: Project is deferred 5 years to the next capital plan.

Key Assumptions:

- The new Jamaica Depot would match the system's highest-performing depots in terms of shifting costs and labor costs for bus maintenance.
- The new facility would serve 250 vehicles, drawing 191 from the existing Jamaica Depot, 29 from Queens Village, and 30 from Casey Stengel.
- In the absence of this investment, there would be no deterioration of existing conditions at Jamaica Depot
- Useful life of the facility is 100 years

Not included in this analysis:

- Improved working conditions for MTA employees
- Reduced maintenance costs for deteriorating Jamaica facility
- Avoided costs of handling hybrid-engine vehicles.
- Potential that improved maintenance and vehicle storage will reduce lifecycle costs

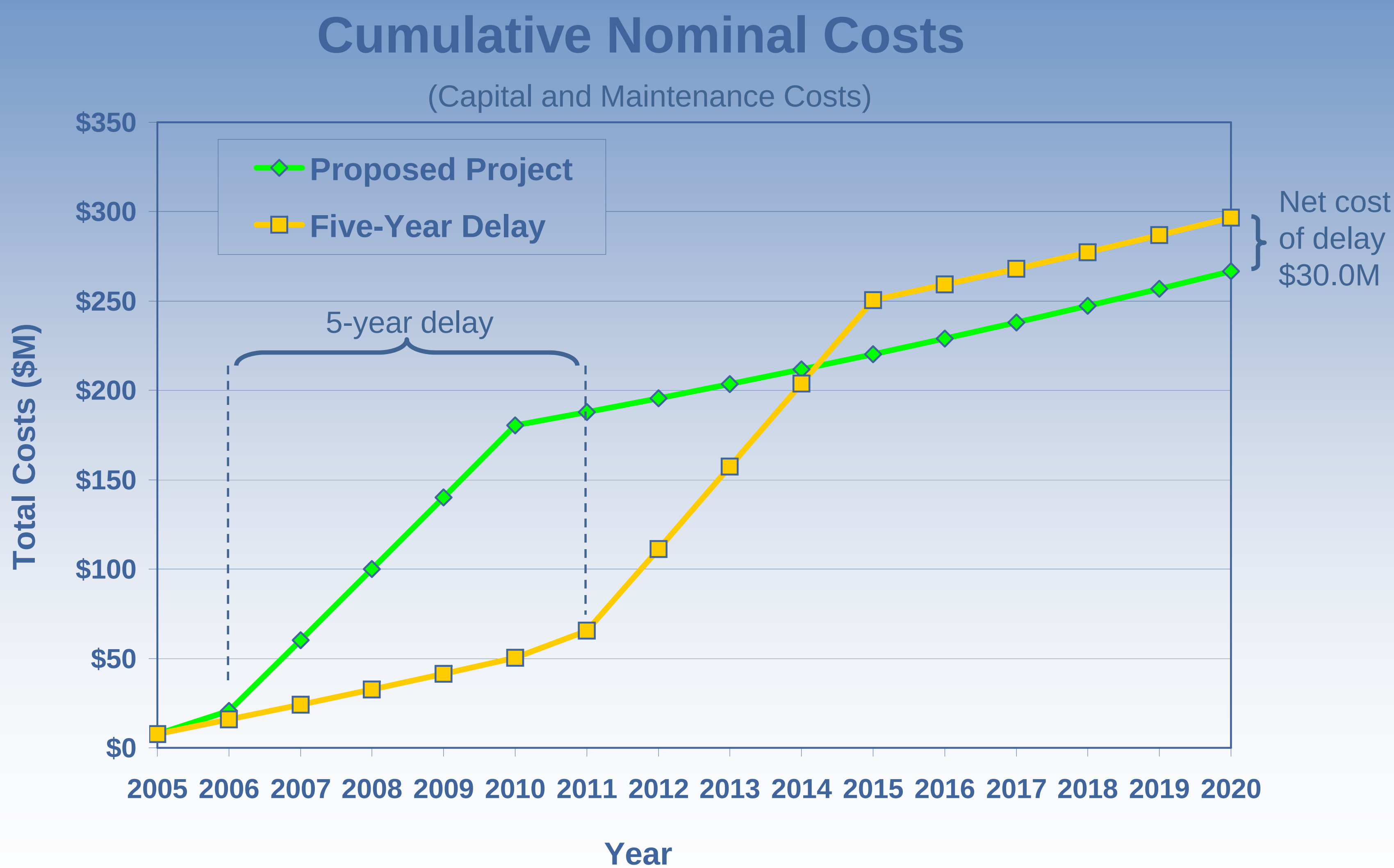
Jamaica Bus Depot
Cost-benefit analysis results

Impact	Net Year-of-Expenditure Costs ($M)	Description
"Reliability Tax"	**$0.0**	
"Efficiency Tax"	**$9.3**	Reduced bus shifting needs, and reduced time per maintenance task.
"Redundancy Tax"	**$0.0**	
"Capital Tax"	**$0.0**	
Cost Escalation	**$20.7**	Five-year delay in construction and land acquisition.
Net Budgetary Impact	**$30.0**	Net cost of five-year delay

- Building the depot now saves $30 million (in current-year dollars) compared with delaying the investment for five years.
- A 5-year delay effectively adds 23% to the capital cost of pursuing the project now.

Jamaica Bus Depot

Cost-benefit analysis results



Cross Bay Bridge Deck Rehab
Key Assumptions

Scenario Tested: Current proposal vs. beginning project 9 years earlier (constructing project in 2006 as is currently being considered vs. in 1997 as originally proposed).

Key Assumptions:

- Timely completion of the original repaving and waterproofing project would have prevented the subsequent expansion in the scope of work needed.
- All maintenance costs in excess of the average maintenance costs for a bridge this size are due to the deferred maintenance.
- No social costs from the increased potholes and duration of construction are included in the cost-benefit analysis.

Cross Bay Bridge Deck Rehab
Cost-benefit analysis results

Impact	Net Year-of-Expenditure Costs ($M)	Description
"Reliability Tax"	**$1.1**	Increased maintenance and emergency repairs.
"Efficiency Tax"	**$0.0**	
"Redundancy Tax"	**$0.0**	
"Capital Tax"	**$38.7**	Increased project scope.
Cost Escalation	**$2.3**	Nine year delay in construction.
Net Budgetary Impact	**$42.2**	Net cost of nine-year delay.

- Accounting for inflation and borrowing costs, investing in this project in 1997 would have had a $34.1M present value benefit (in 2005 dollars).
- The 9-year delay effectively added 548% to the original capital cost of the project.

Cross Bay Bridge Deck Rehab
Cost-benefit analysis results

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Verrazano Deck Replacement
Key assumptions

Scenario Tested: Project is deferred 2 years (begin construction in 2010 instead of 2008).

Key Assumptions:

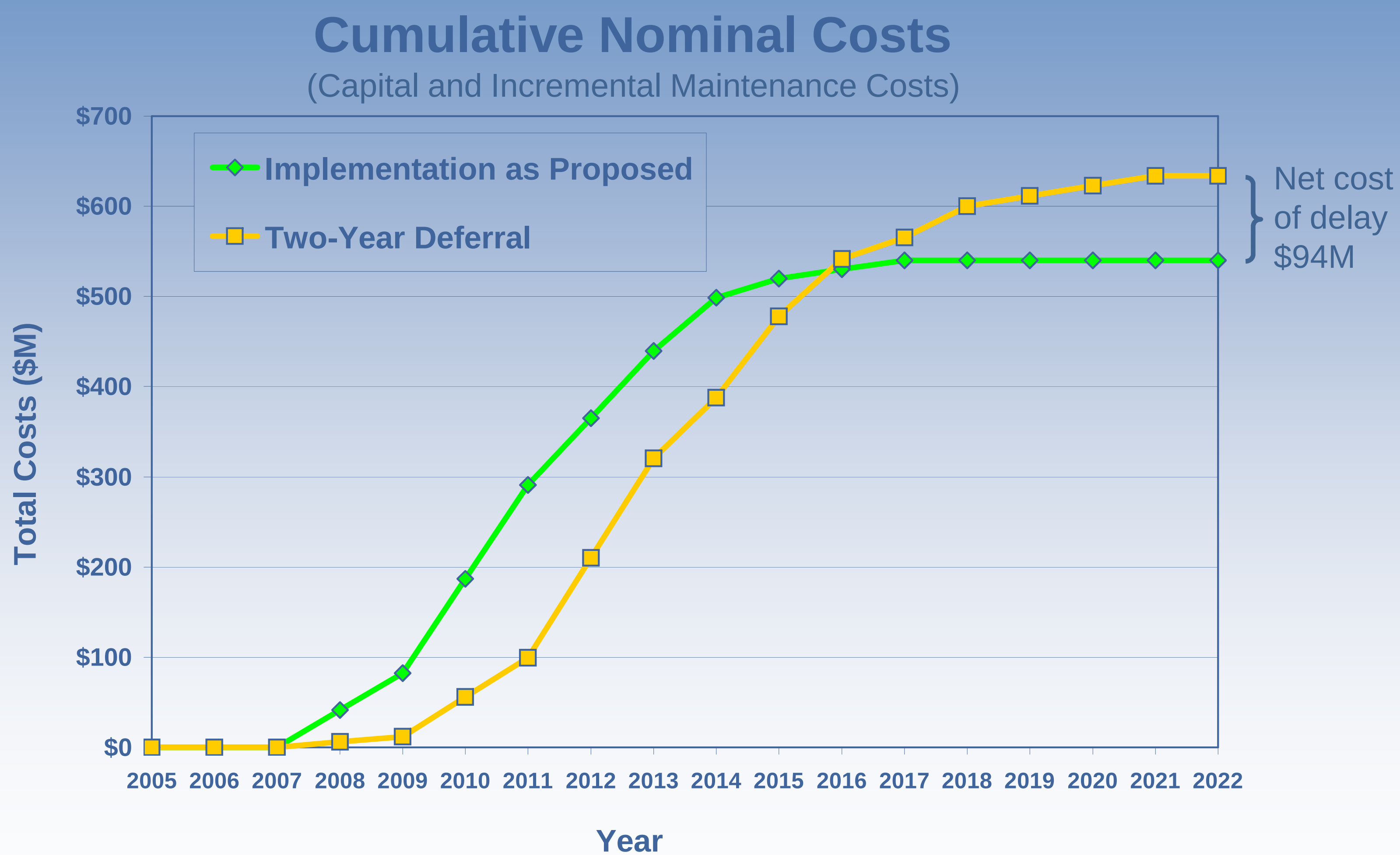
- Postponing this project will delay four other projects by 2-4 years.
- This delay will require the scope of another project – rehabilitation of the Lower Level deck (VN-80B) – to be expanded into a full deck replacement project. This will roughly double its cost.
- Annual maintenance costs for Upper Level deck are $6 million per year higher than they would be for a facility in a state of good repair.

Verrazano Deck Replacement
Cost-benefit analysis results

Impact	Net Year-of-Expenditure Costs ($M)	Description
"Reliability Tax"	**$12.0**	Additional maintenance and emergency repairs.
"Efficiency Tax"	**$0.0**	
"Redundancy Tax"	**$0.0**	
"Capital Tax"	**$45.0**	Increase in project scope for VN-80B.
Cost Escalation	**$36.9**	2-4 year delay in construction.
Net Budgetary Impact	**$93.9**	Net costs of two-year delay.

- Including inflation and borrowing costs, investing now has a $18 million present value benefit (in 2005 dollars).
- 2-year delay effectively adds 57% to the capital cost of the project.

Verrazano Deck Replacement
Cost-benefit analysis results



Commuter Rail Power Distribution
Key assumptions

Scenario Tested:.Project deferred by five years.

Key Assumptions:

- Capital funds expended at constant rate, and benefits phased in proportionally to expenditure of funds.
- Modernization of substations allowed the elimination of 56 substation operator positions, saving $2.65 million per year.
- Energy savings assumptions:
  - Substations are spaced evenly over the 56 miles of the project
  - Third rail resistance dropped from 0.0125 to 0.0038 ohms/1000 ft
  - Power requirements per car range from 250 kW when idle to 640 kW at full speed.
  - Acceleration and deceleration each take 40 seconds; dwell time at stations is 45 seconds.
- Delay of project assumed not to affect quantity of service provided.

Commuter Rail Power Distribution

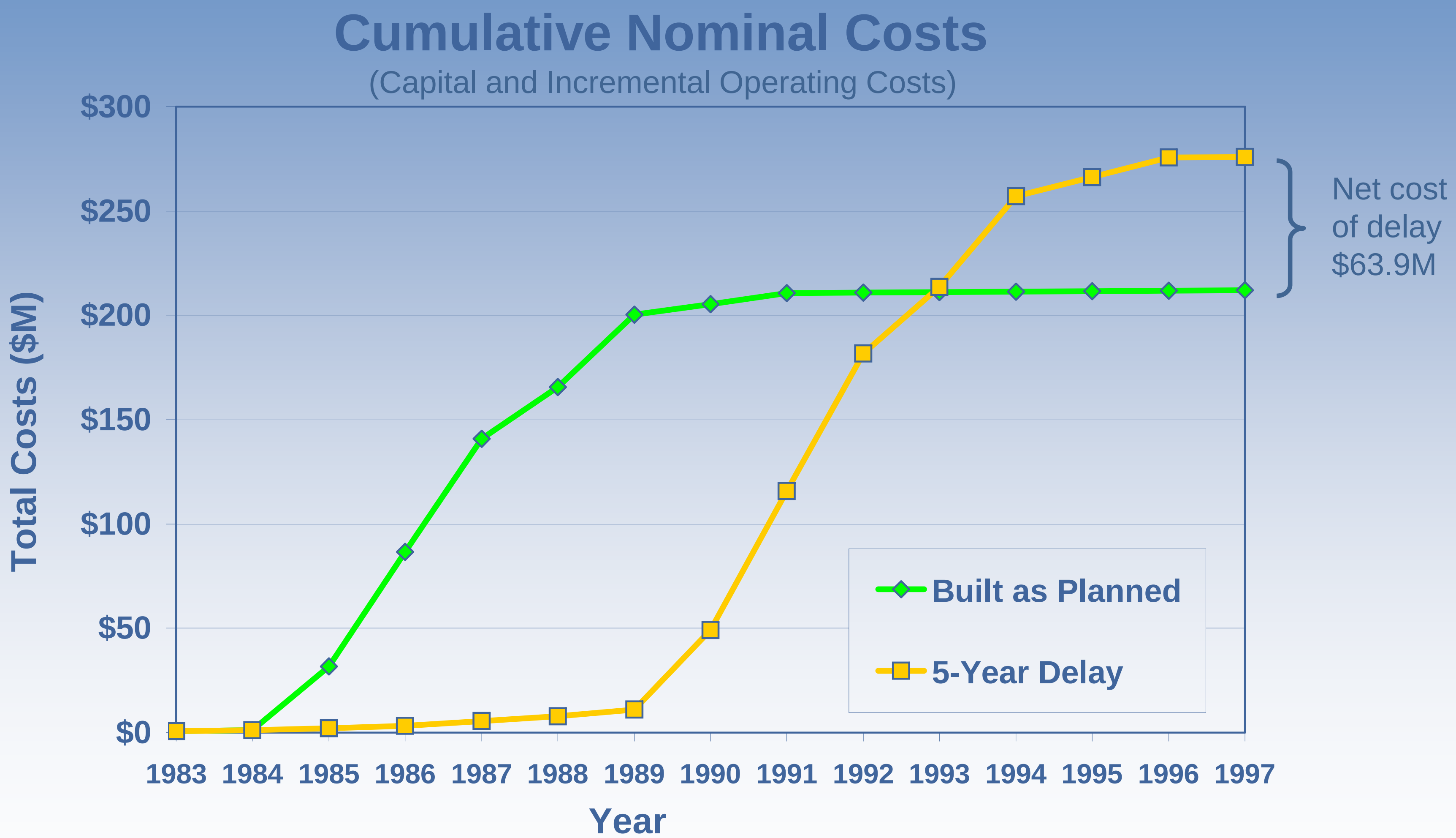
Cost-benefit analysis results

Impact	Net Year-of-Expenditure Costs ($M)	Description
"Reliability Tax"	**$0.0**	
"Efficiency Tax"	**$30.8**	Higher personnel and energy costs.
"Redundancy Tax"	**$0.0**	
"Capital Tax"	**$0.0**	
Cost Escalation	**$33.1**	5-year delay in construction.
Net Budgetary Impact	**$63.9**	Net costs of 5-year delay.

- Including inflation and borrowing costs, investing in the project when MTA did had a $10.8 million present value benefit (in 2005 dollars), compared with a 5-year delay.
- Five-year delay effectively adds 30.7% to the capital cost of the project.

Commuter Rail Power Distribution

Effects of Deferral



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Concrete Tie Installation
Key assumptions

Scenario tested: Continue with wood tie replacement cycle vs. install concrete ties.

Key Assumptions:

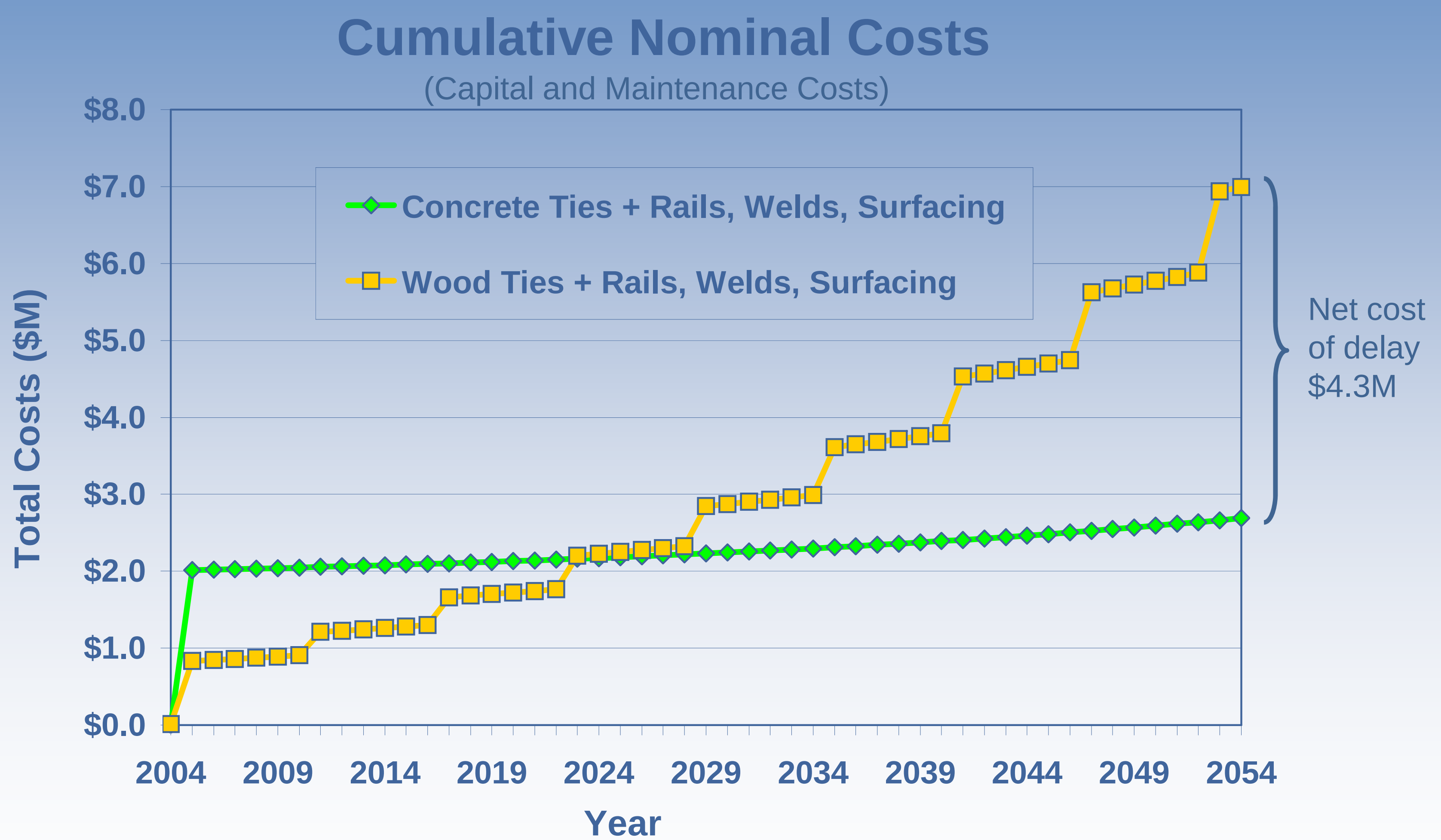
- Analyzed generic 1-mile project, based on average system-wide installation costs
- In wood tie replacement case, rails are replaced in Year 1. Concrete ties replacement has a positive NPV as long as the rails on wood ties need replacement by Year 20.
- Costs and benefits not included:
  - Replacing broken or flawed rails
  - Track outages for maintenance
  - Schedule changes and busing programs
  - Purchasing, maintaining, or leasing equipment
  - Improved track quality
  - Higher average costs of wood tie replacement in high-volume areas

Concrete Tie Installation
Cost-benefit analysis results

Impact	Net Year-of-Expenditure Costs ($M)	Description
"Reliability Tax"	**$0.0**	
"Efficiency Tax"	**$19.9**	Greater frequencies for unscheduled tasks (rail, weld, surfacing for wood ties; surfacing for concrete ties).
"Redundancy Tax"	**$0.0**	
"Capital Tax"	**$41.5**	Lower costs for scheduled tasks (just ties for wood ties; ties, rail, and welds for concrete ties).
Cost Escalation	**$178.2**	Rising costs over 50 years of ongoing capital and maintenance work.
Net Budgetary Impact	**$239.7**	Average cost of using wood ties instead of concrete

- Including inflation and borrowing costs, conversion of 56 miles to concrete ties has a net present benefit of $10.2 million.
- This savings represents 214% of the capital costs of the proposed investment..

Concrete Tie Installation
Cost-benefit analysis results



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Conclusions

Focusing only on internal budgetary benefits, the case studies illustrated how timely capital investments:

- Improve support facilities like shops and depots enabling more efficient operations and lower maintenance costs.
- Arrest structural deterioration thereby lowering maintenance costs and averting more expensive replacement projects.
- Upgrade infrastructure such as power and track improving service, reducing operating and maintenance costs, preventing costly disruptions in service.

Investment in the core capital program now will ensure that…

- MTA will have even more capital funds for future discretionary investments.
- MTA's operating units can continue their efforts to improve productivity.
- MTA will have the basic infrastructure in place to take advantage of the full benefits of "system improvement" investments.
- The public will see continuous improvement in the quality of MTA's services.

Conclusions

The estimates in this study are conservative. They do not include:

- Key internal benefits that could not be quantified due to data limitations.
- Benefits to MTA customers.
- Benefits to region more generally.
- Secondary effects of customer and social benefits on MTA revenues.

Despite these conservative assumptions, the study found that good repair delivers higher performance at a lower price.

- Failing to reinvest in the system costs more in the long run.
- Minimizing long-run capital and operating costs requires analysis of the optimal reinvestment schedules for each asset category.
- Reinvesting below these levels damages the system's quality, efficiency, and reliability, raising costs for both the agency and its customers.

Conclusions

MTA and the operating agencies will have a continuing need for strategic analysis of capital planning proposals.

- In 1981, Richard Ravitch said "operating budgets are inexorably intertwined with the requirements of capital replenishment." This remains is as true as ever.
- Ties between operating and capital programming need strengthening.
- This requires the tracking of key operating data across the full range of asset categories, tied to key policy variables to facilitate analysis.
- But it is critical to recognize that many projects <u>cannot be analyzed in isolation</u> – they often have strategic interrelationships that must be analyzed on a *programmatic* basis:
  - A group of subprojects may all need to be completed to fulfill a single common strategic objective and provide significant benefits.
  - But individually, some may not appear beneficial if the analysis is drawn too narrowly.

Recommendations

MTA should incorporate into its capital planning and its daily operations a more strategic approach to asset management.

- Asset management systems provide a framework that seeks optimum benefits at minimum cost.
- They help prioritize investments, reduce risk, communicate value, and ensure that investment decisions are tied to the organization's mission.
- The quality and effectiveness of asset management efforts depends on the quality of information available on direct and indirect costs, benefits, and risks.

MTA capital planning should assess a wide range of project benefits:

- Operating and budget impacts
- Risk reduction
- User benefits

For these analyses to be useful in the capital planning process, operating agencies need to track costs and performance more systematically and creatively.