Engineering and Operations Committee

Item # 6a

Subject: Engineering Performance Measures
Facility Design

Purpose: To provide update on performance measures used by the Engineering Services Group in the design of capital projects

Engineering and Operations Committee

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Summary

This presentation will provide an update on the design cost performance measure used in the Engineering Services Group, and the civil infrastructure industry, to evaluate construction project delivery efficiency.

Engineering Performance Measures: Facility Design

Engineering and Operations Committee
Item 6a
October 13, 2014

Background

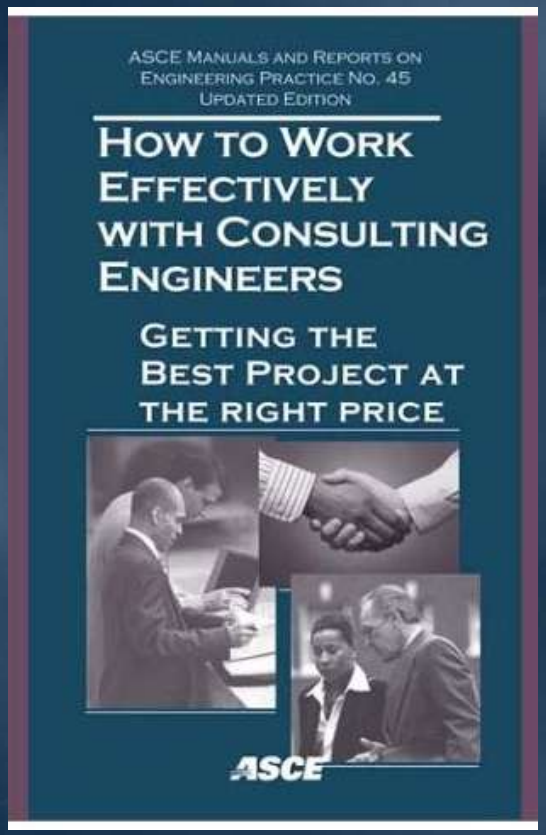
- Engineering Services performance measures:

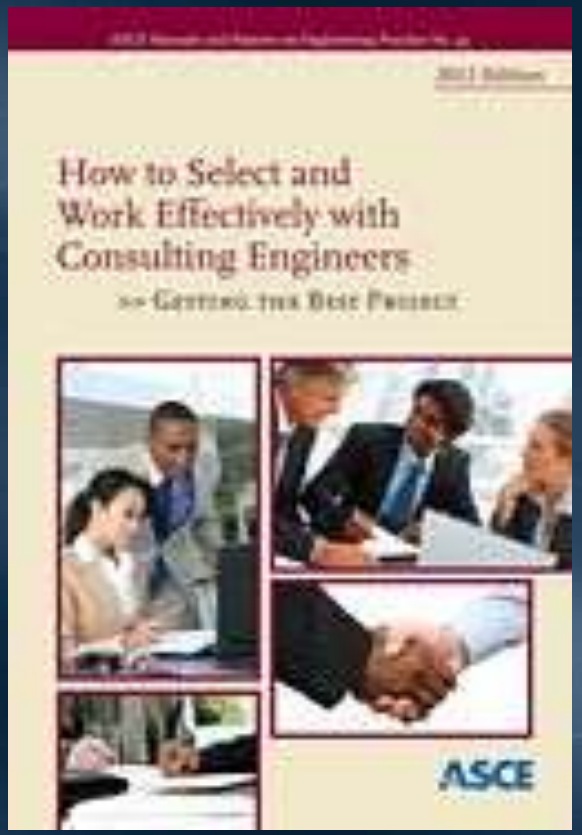
Function	Performance Measure	Target
Design	Design as % of Construction Cost	>$3M: 9-12% <$3M: 9-15%
Inspection	Inspection as % of Construction Cost	>$3M: 9-12% <$3M: 9-15%

- Simple & well-defined
- Long history of use within industry
- Easy for engineers to apply & for stakeholders to understand
- Useful for cross-checking budgets

Traditional Performance Paradigm is Strongly Institutionalized

- ASCE Manual of Practice No. 45





Design Cost Includes

- Preparation of design calculations (equipment sizing, structural, electrical loads, etc.)
- Preparation of construction drawings & specifications
- Development of permit data for regulatory authority approvals
- Engineer's cost estimate

Design Cost Does Not Include

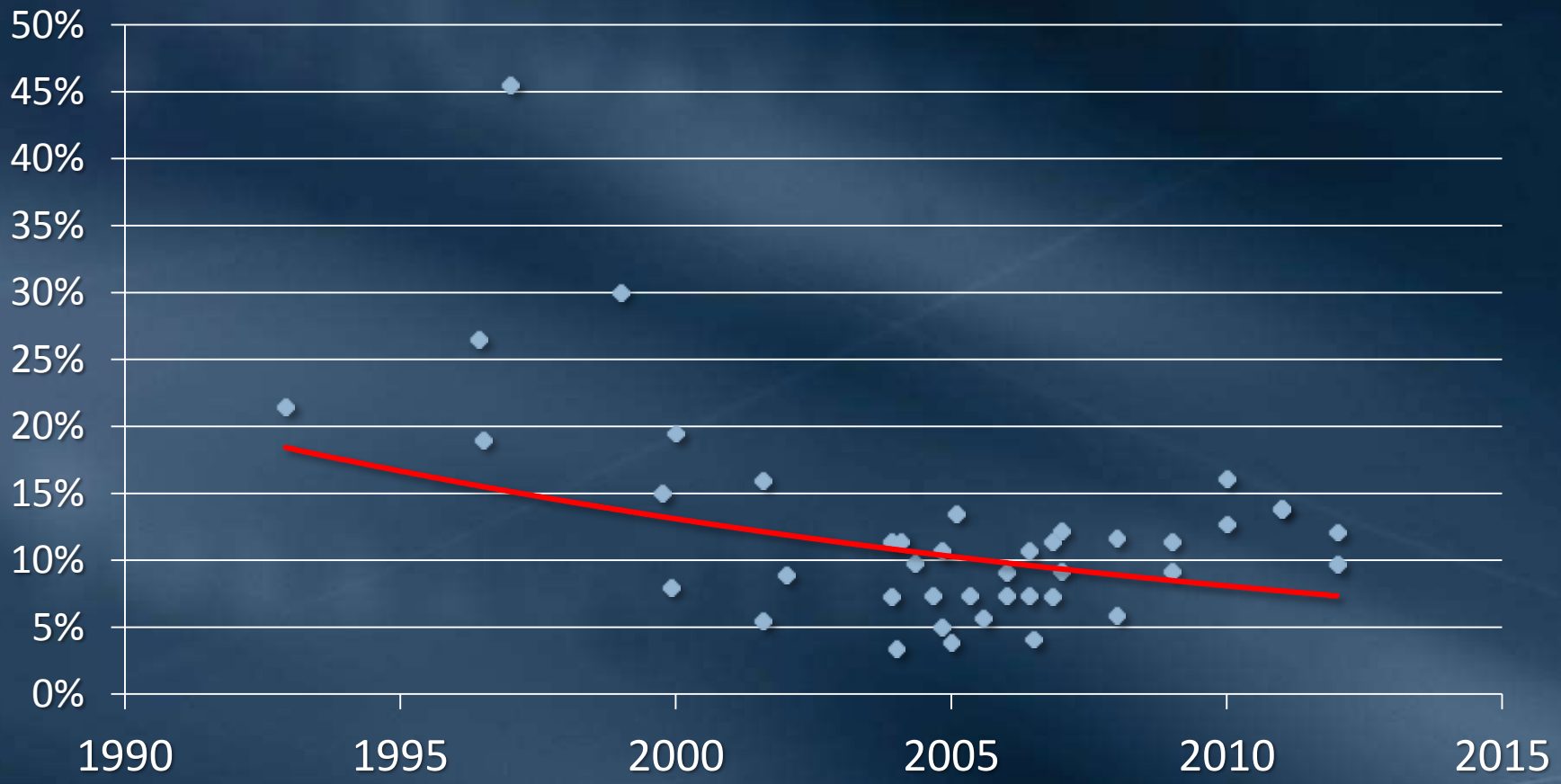
- Preliminary design
- Bid phase activities
- Construction phase support
- Special services, i.e.:
  - Geotechnical engineering
  - Survey
  - Environmental documentation

Variables for Design Cost % Metric

$$\text{Design Cost (\%)} = \frac{\text{Design Cost (\$)}}{\text{Const. Cost (\$)}}$$

- Const. cost is an estimate at start of design
- Actual construction bids vary with:
  - Economic cycles
  - No. of bidders
  - Quality of design
  - Location
  - Bidders' assessment of risk
- Metropolitan's performance measure
  - Goal established when design commences
  - Actual results based on final costs

Design Cost % Trend
Completed Projects



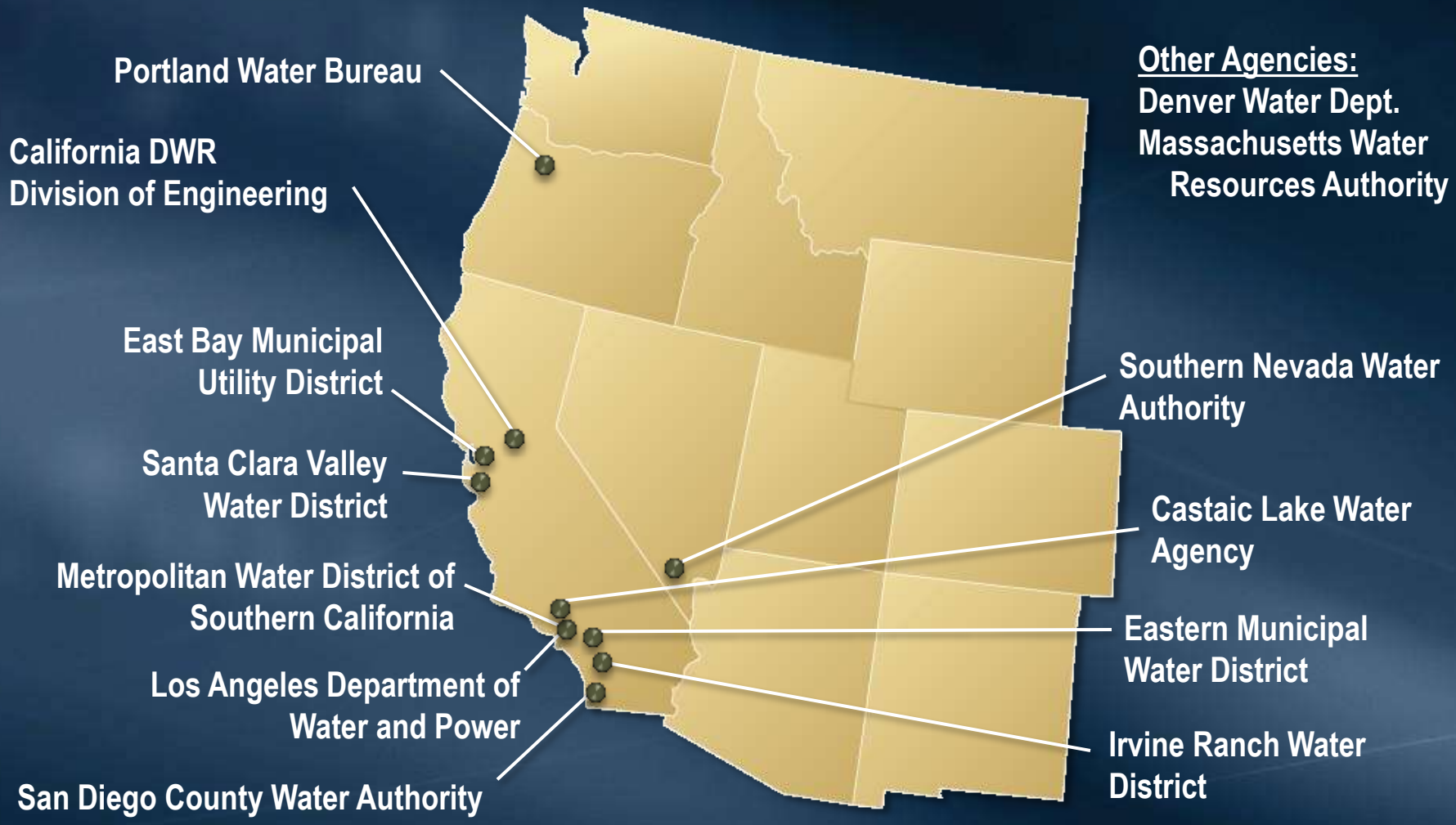
Design Cost %
5-Year Summary

Fiscal Year	Project Cost > $3M	Project Cost < $3M
2012/13	15.2%	11.8%
2011/12	10.0%	13.7%
2010/11	11.9%	13.9%
2009/10	12.7%	16.1%
2008/09	9.3%	13.8%
Targets:	**9 – 12%**	**9 – 15%**
% in Target Range	**88%**	**89%**

West Coast Water Agencies Benchmarking Forum

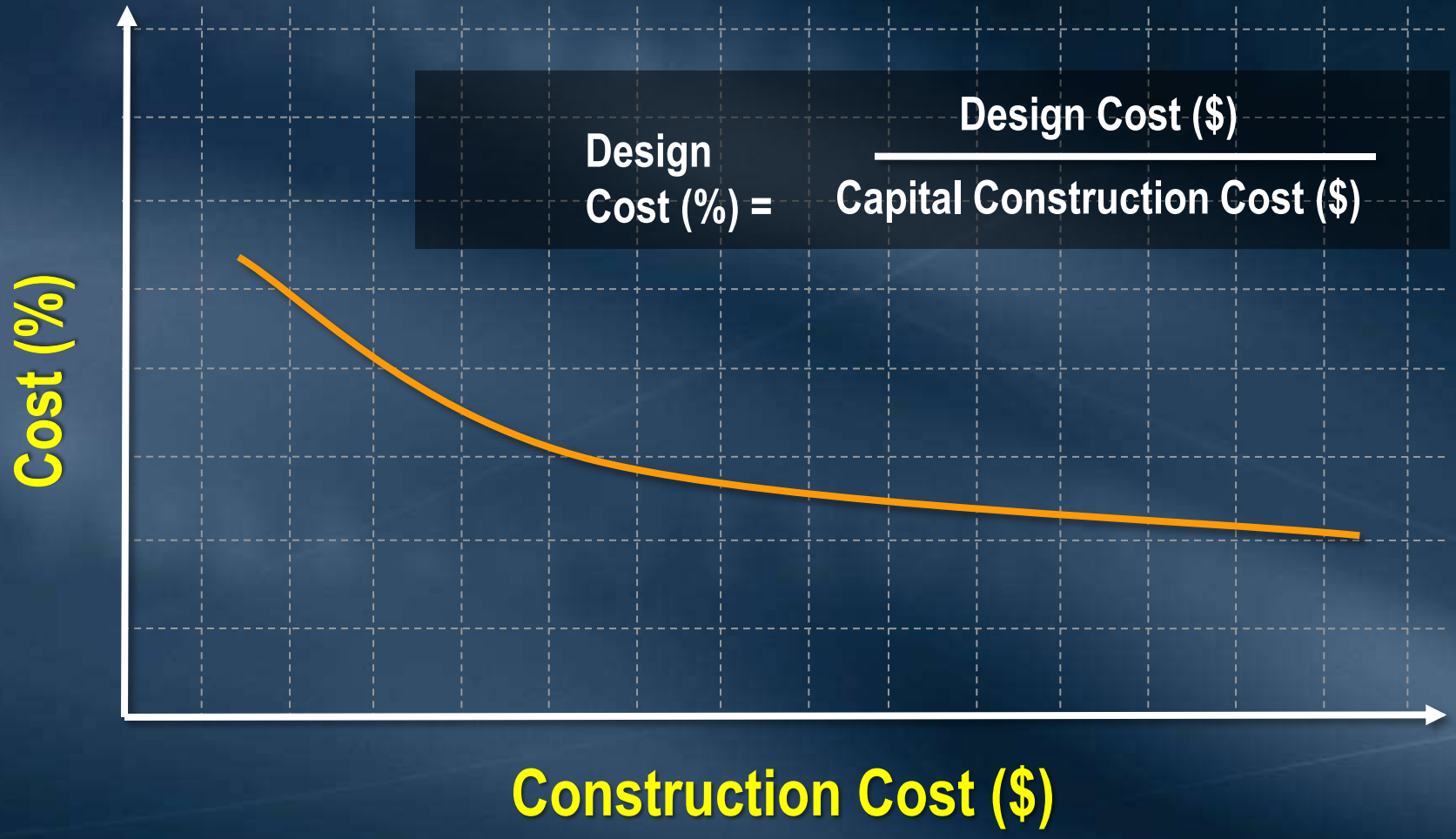
- Sponsored initially by Metropolitan
- Focused on capital project delivery efficiency
- Process included:
  - Data collection & analysis
  - Workshops
  - Case studies
  - Development of Best Management Practices

Benchmarking Participants



Traditional Performance Paradigm

$$\text{Design Cost (\%)} = \frac{\text{Design Cost (\$)}}{\text{Capital Construction Cost (\$)}}$$

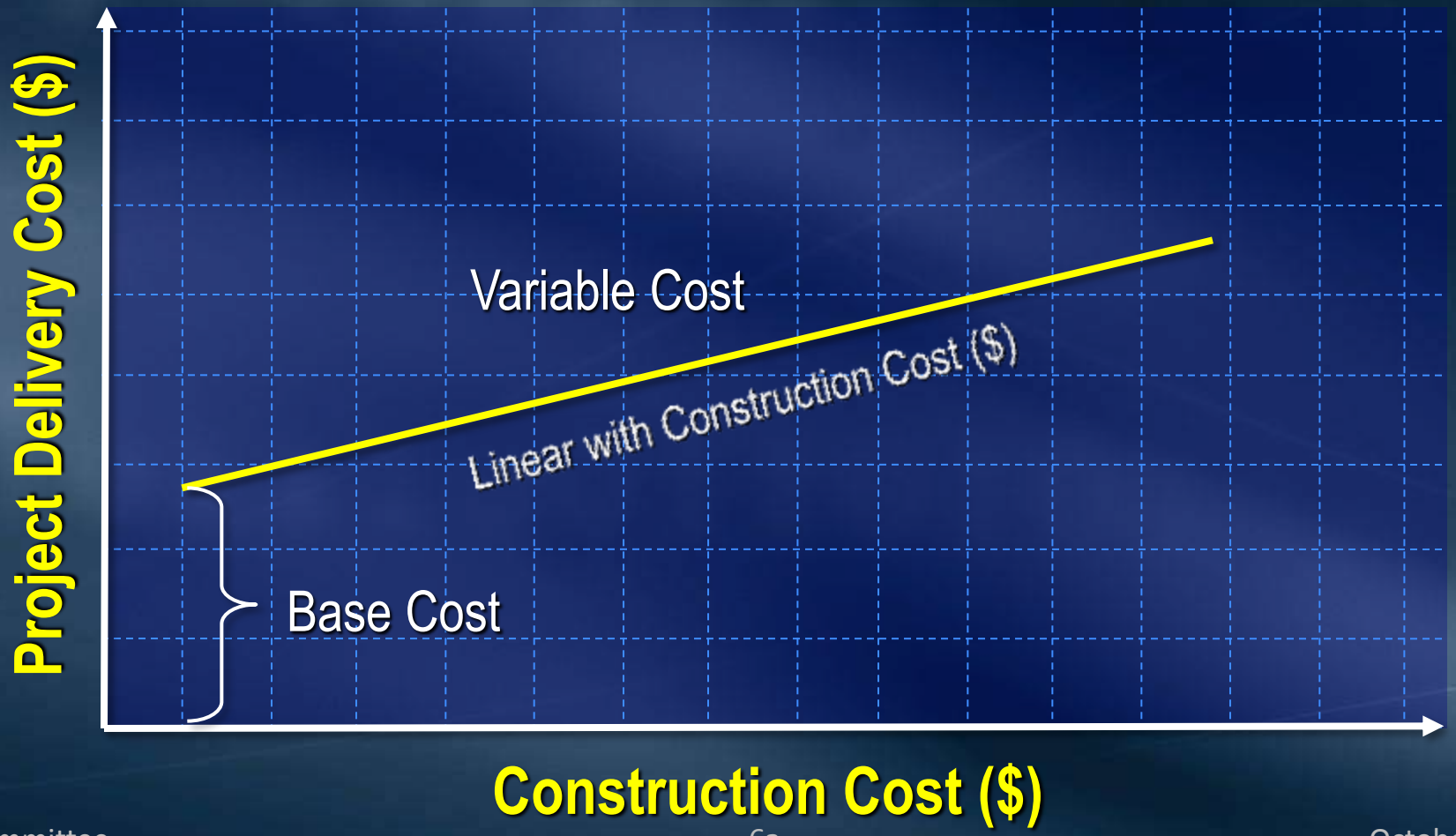


Benchmarking Participants Actual Data

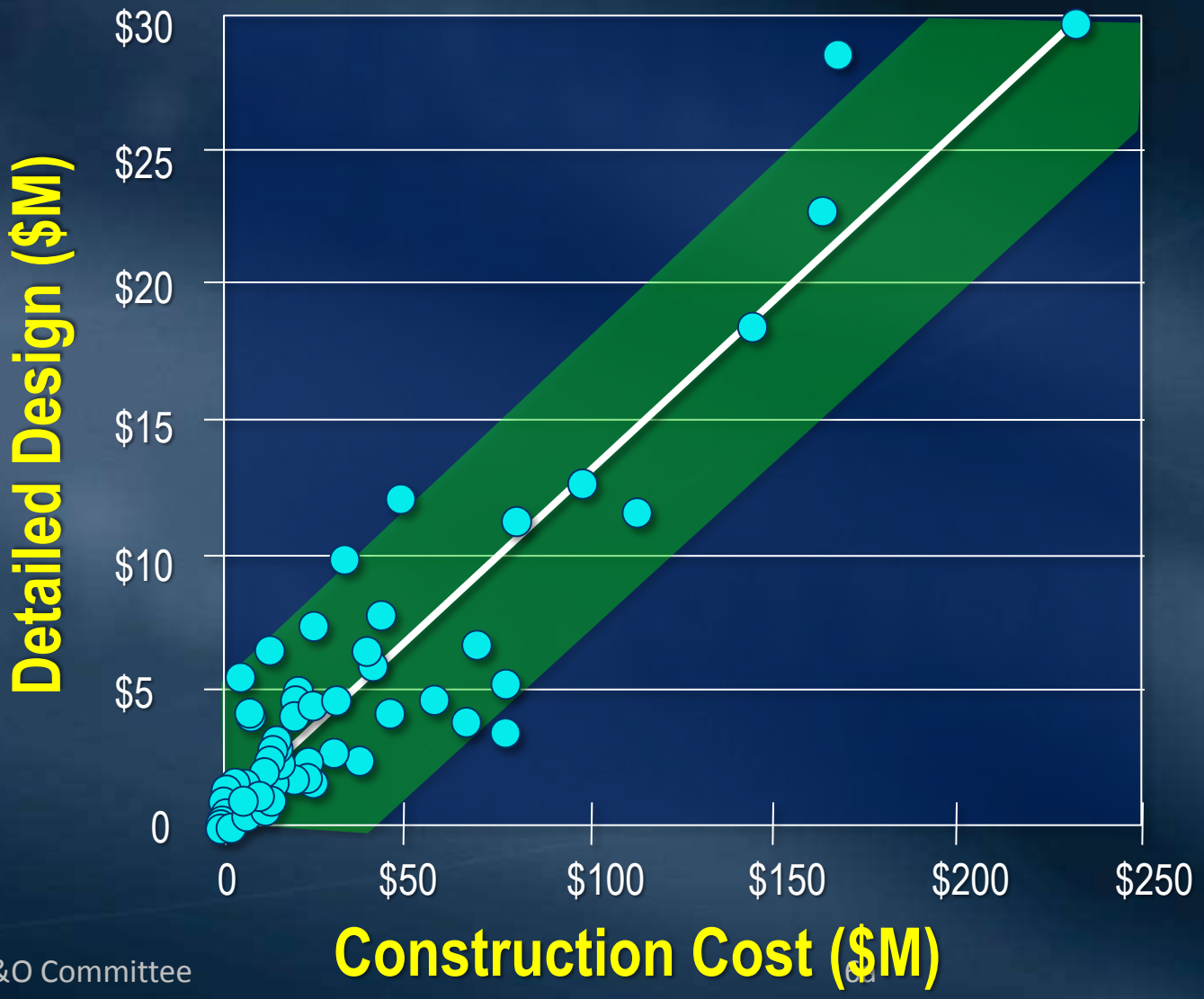
Initial Results Did Not Support Traditional Paradigms

- Low R^2 indicated poor correlation between variables tested
- High p-values indicated lack of statistical significance in results
- Difficult to collect consistent data from all agencies
- "Statistically significant" findings not identified
  - Accounting practices vary by agency &, at times, by project
  - Geographic & time variability
  - Type of facility & complexity of project impacts

Results Support New Conceptual Model of Project Delivery Cost



Improved Correlation of Design Cost



Summary of Findings

- Metropolitan initiated use of performance measures in the early 2000's
- Performance measures are a routine project management practice
- Actual design cost performance falls largely within the target ranges
- The Benchmarking Forum was a successful collaborative process & may be re-started
- Metropolitan design costs tend to be lower than for the other benchmarking agencies

Next Steps

Engineering Services will:

- Continue use of established metrics
- Continue to assess other metrics
- Re-initiate benchmarking process
- Continue focus on cost-effective design & management of project costs


THE METROPOLITAN WATER DISTRICT OF
SOUTHERN CALIFORNIA
1928