CEC Benchmarking Workshop

April 7, 2005

Examples of Sector Specific Benchmarking

Martha Brook, P.E., PIER Buildings Program

Karl Brown, P.E., CIEE

K-12 School Benchmarking

- In 2002, MIT worked with the West Contra Costa School District and PG&E to benchmark 49 schools
- 39 Elementary, 5 Middle, 5 High Schools
- Provided WCCUSD useful energy use and energy cost comparisons
- PIER Final Report:

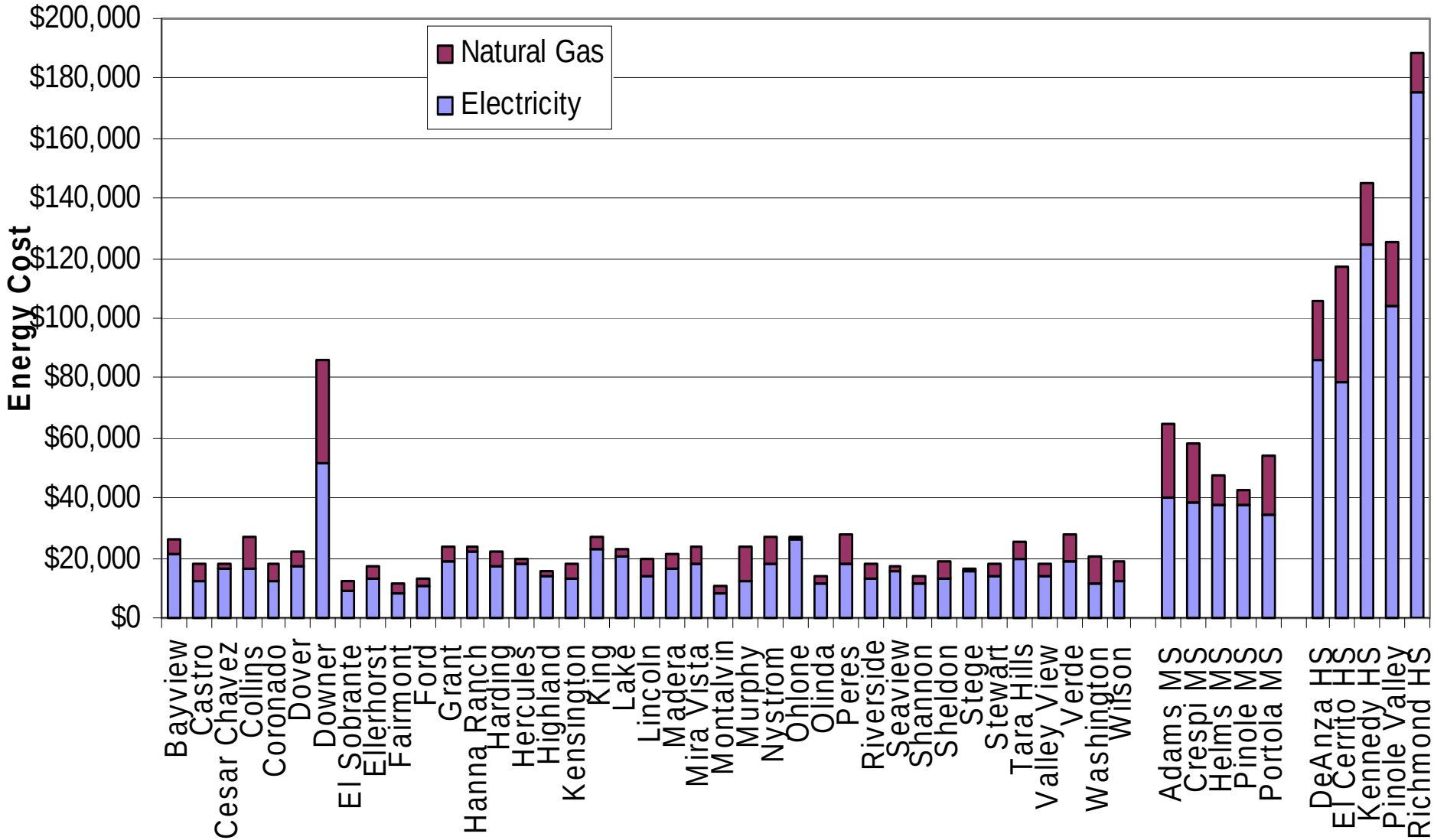
  High Performance Commercial Building Systems

  Commercial Building Energy Use Benchmarking

  http://www.energy.ca.gov/reports/2003-11-20_500-03-097F-A01.PDF

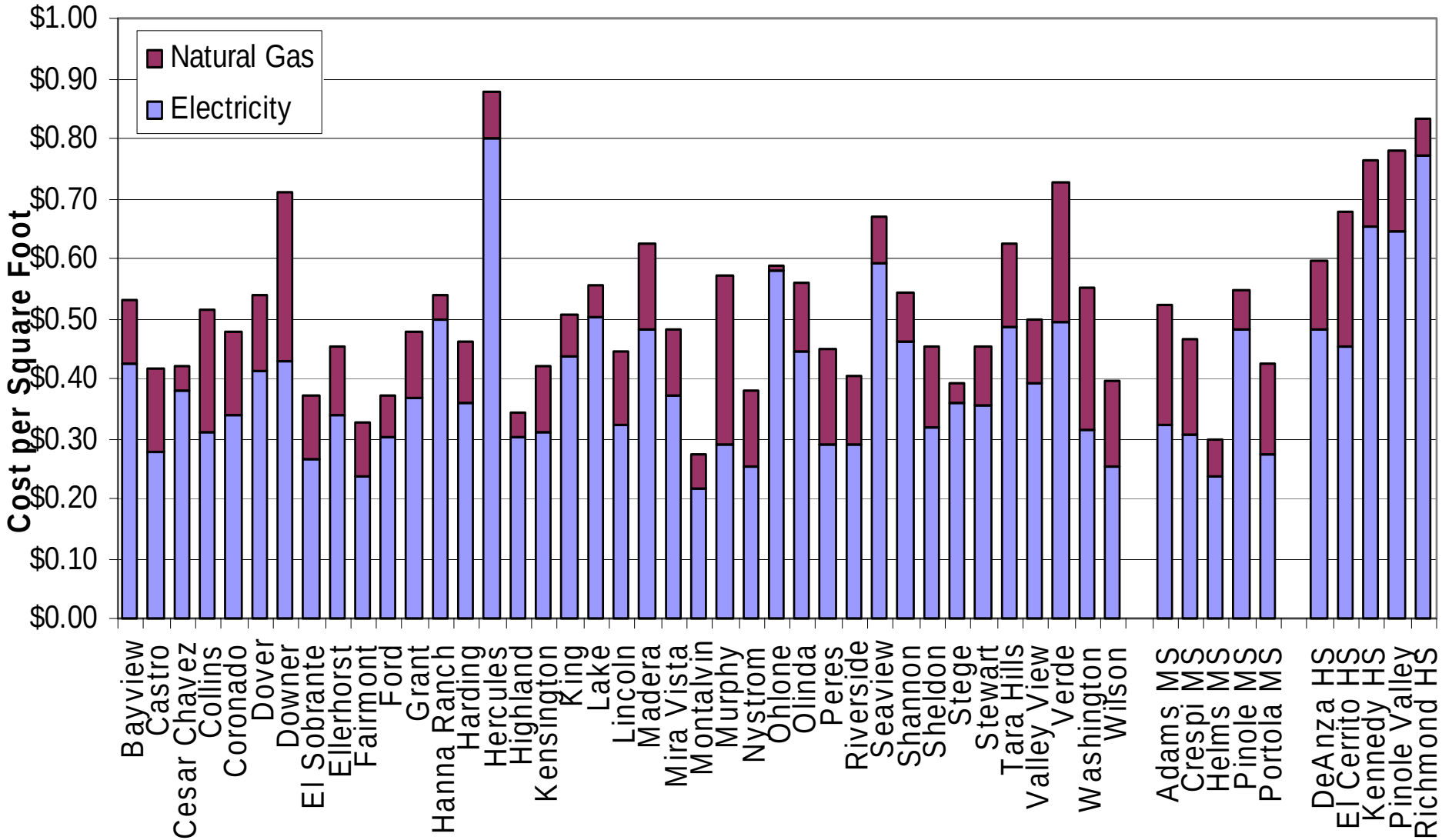
WCCUSD

Absolute Energy Cost



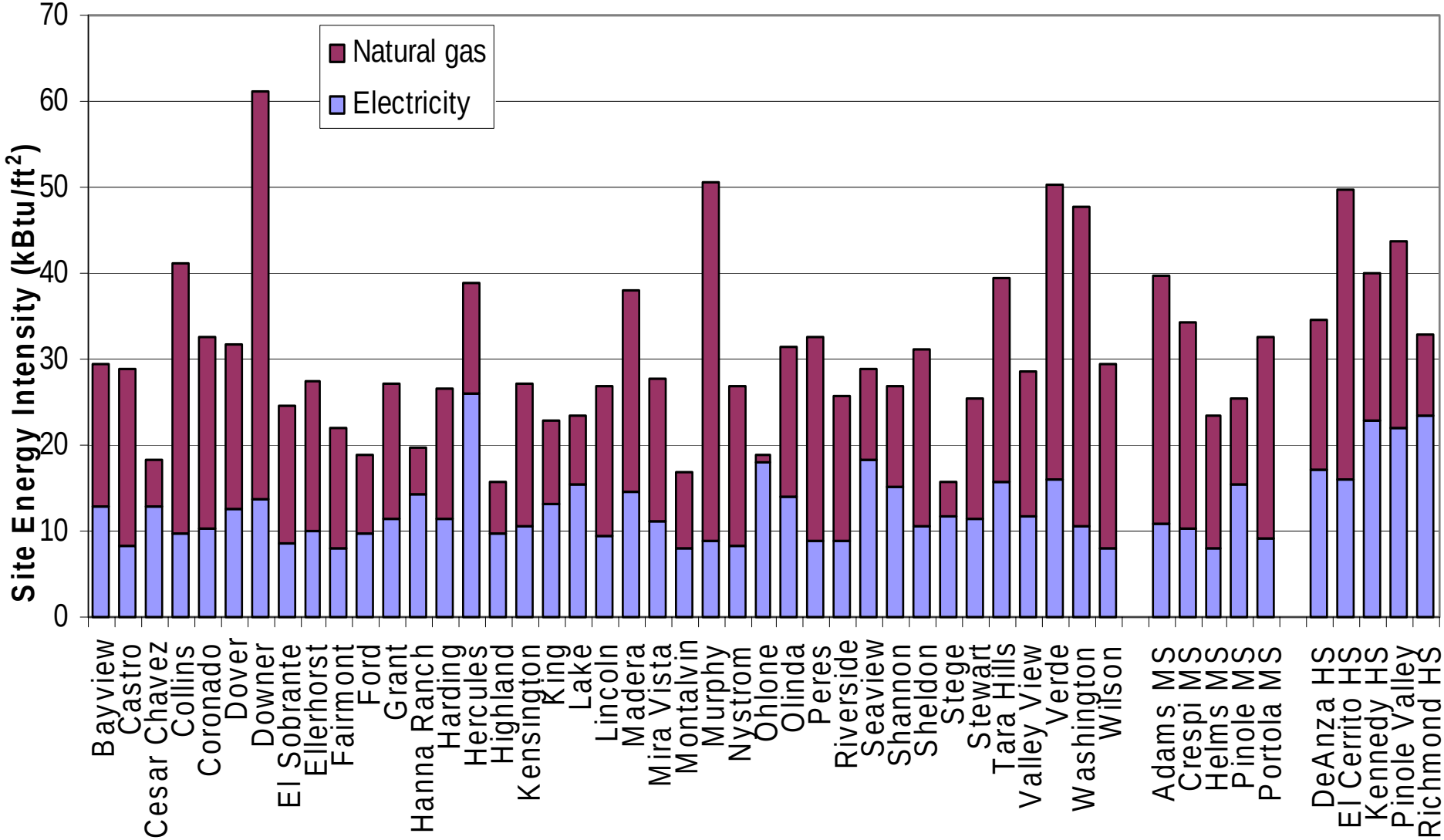
WCCUSD

Energy Cost per Sq. Ft.



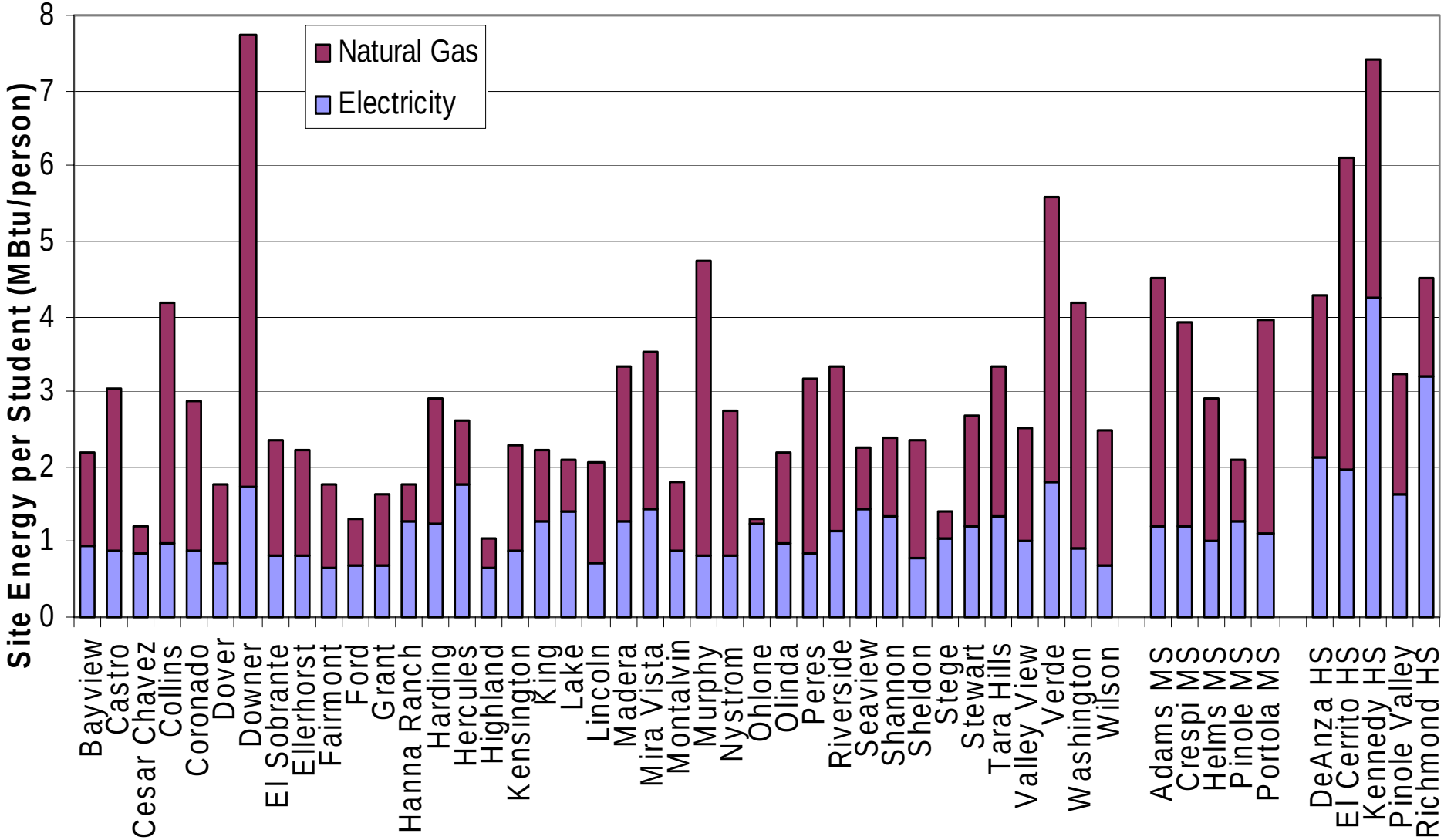
WCCUSD

Energy Use per Sq. Ft.



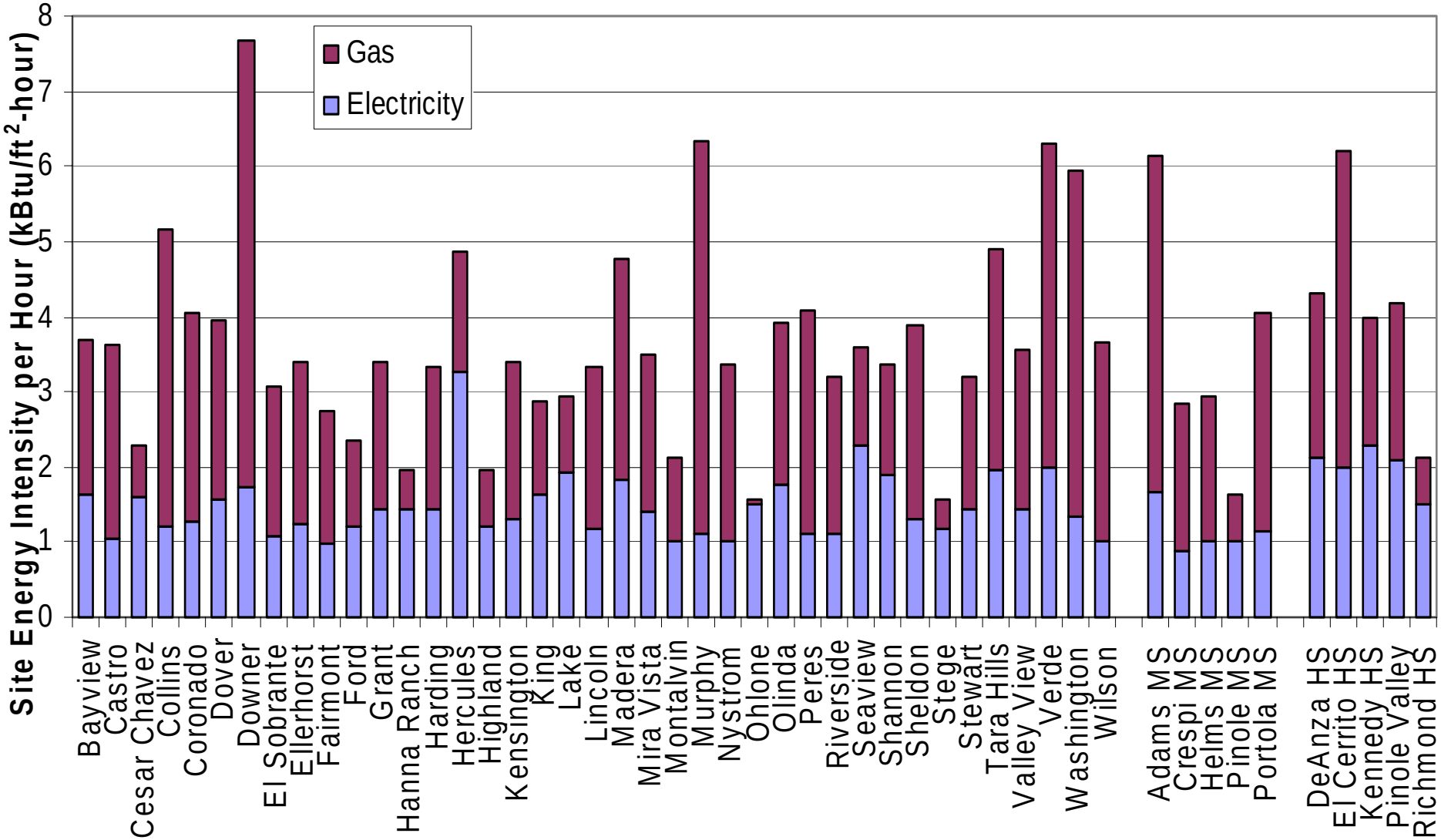
WCCUSD

Energy Use per Student

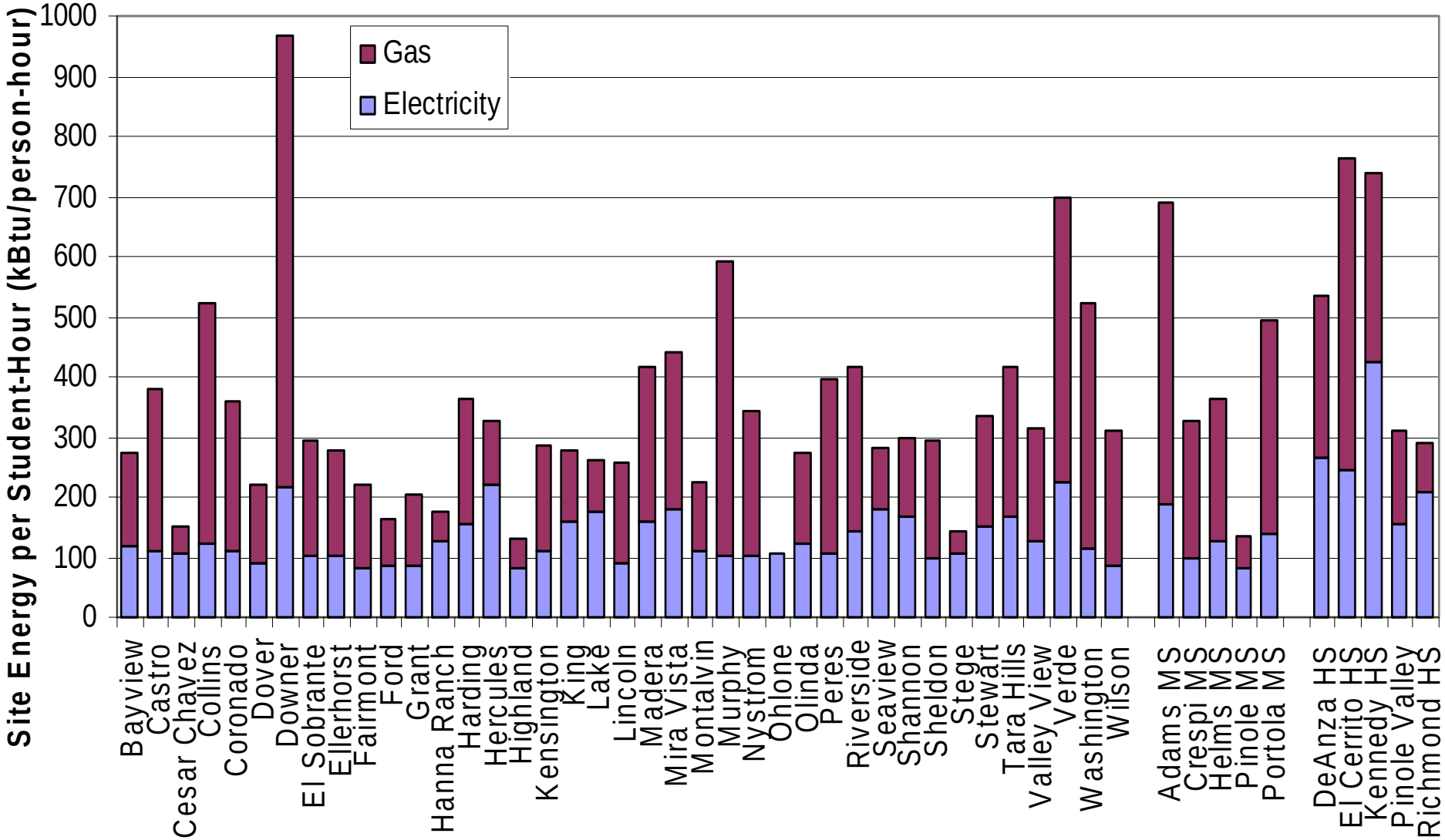


WCCUSD

Energy Use per Hour

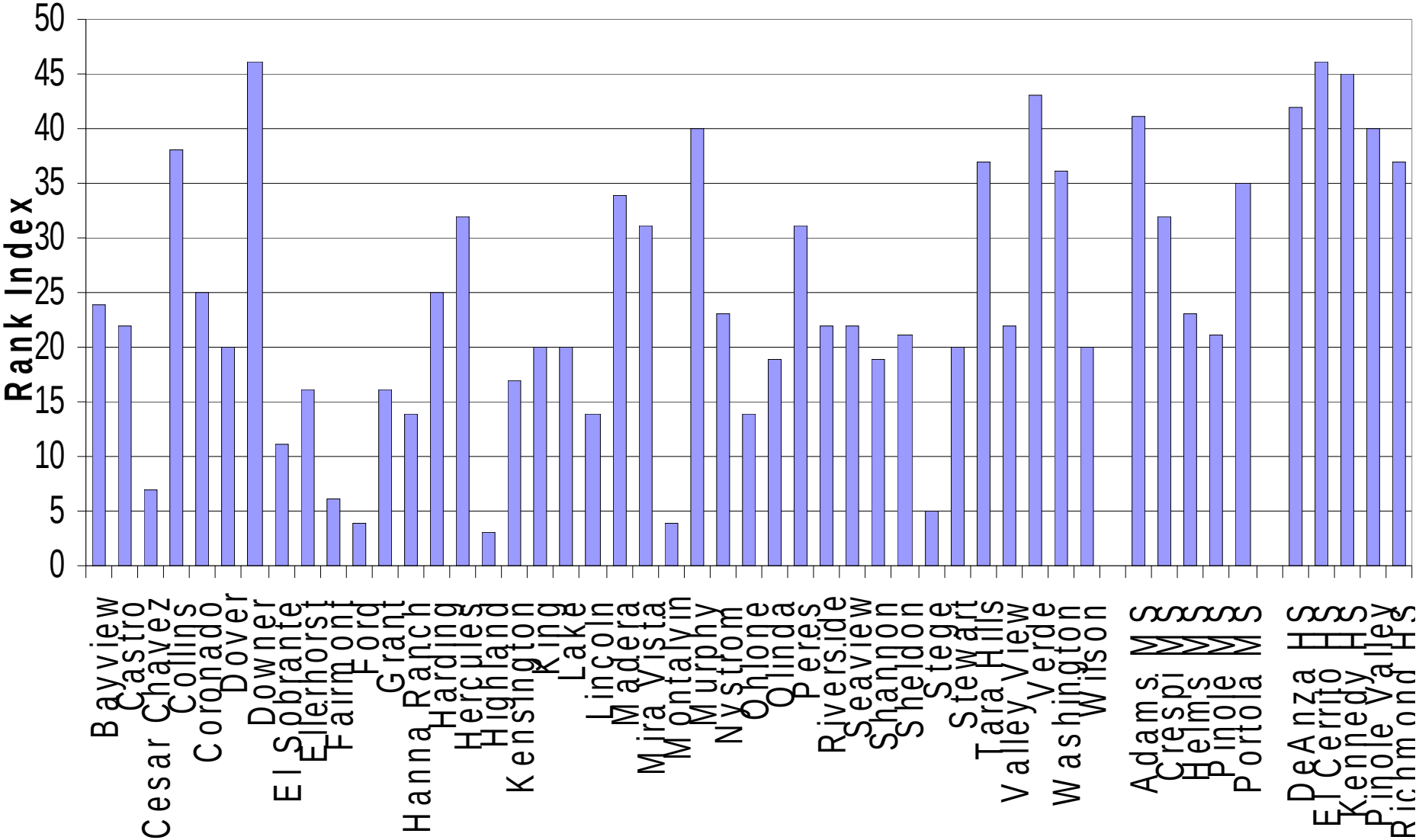


Energy Use per Student-Hour



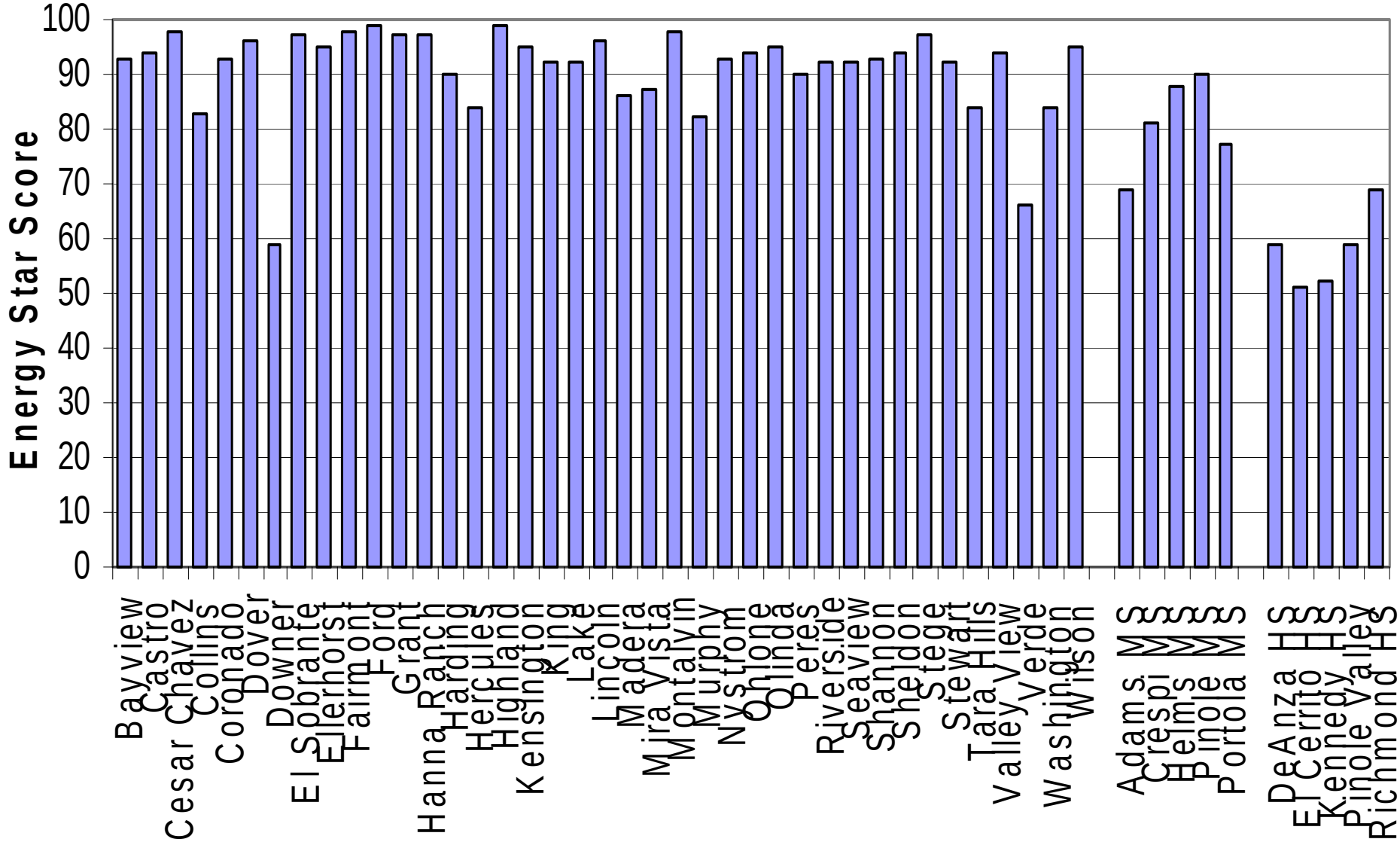
WCCUSD

Rank Index

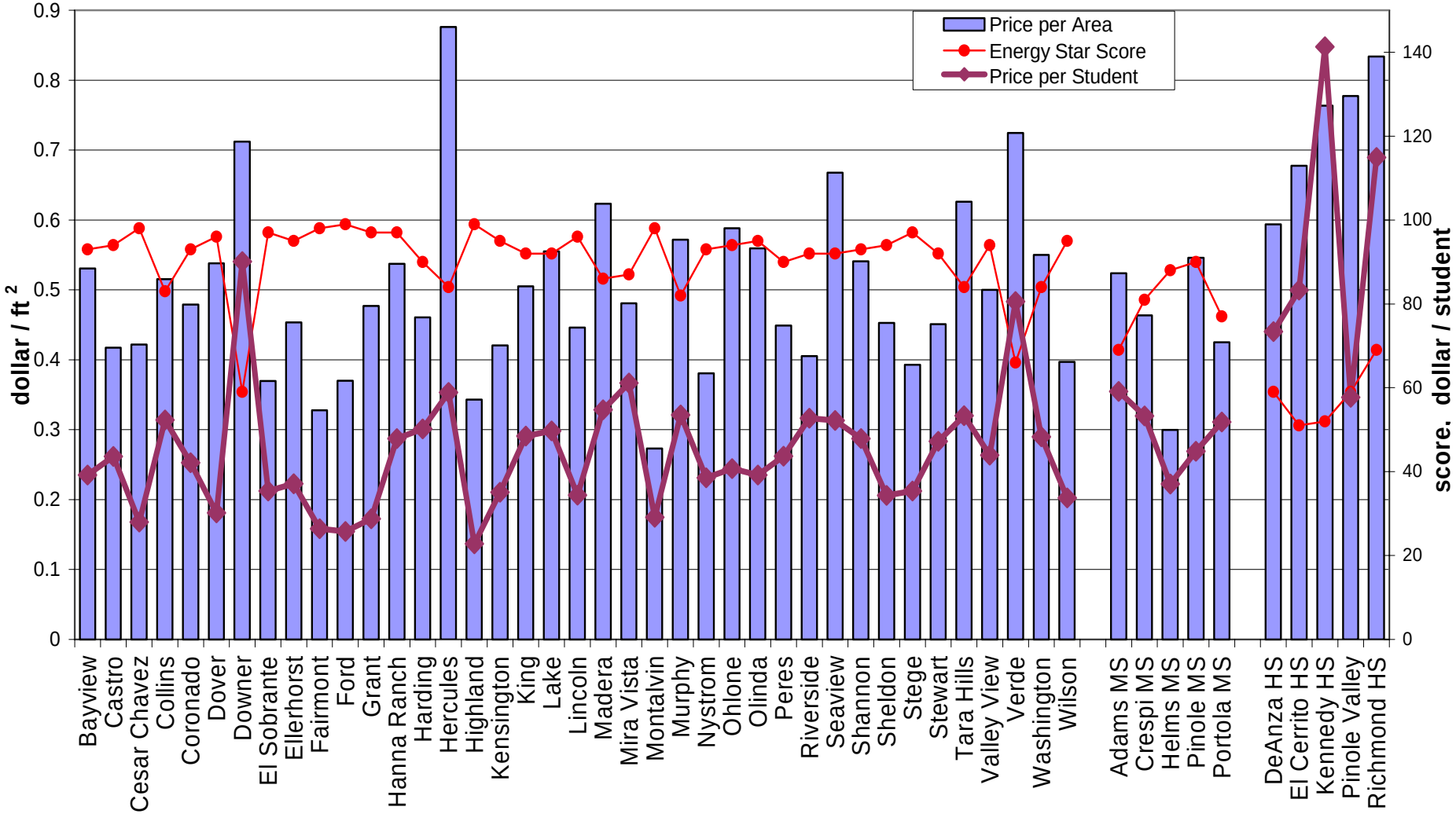


WCCUSD

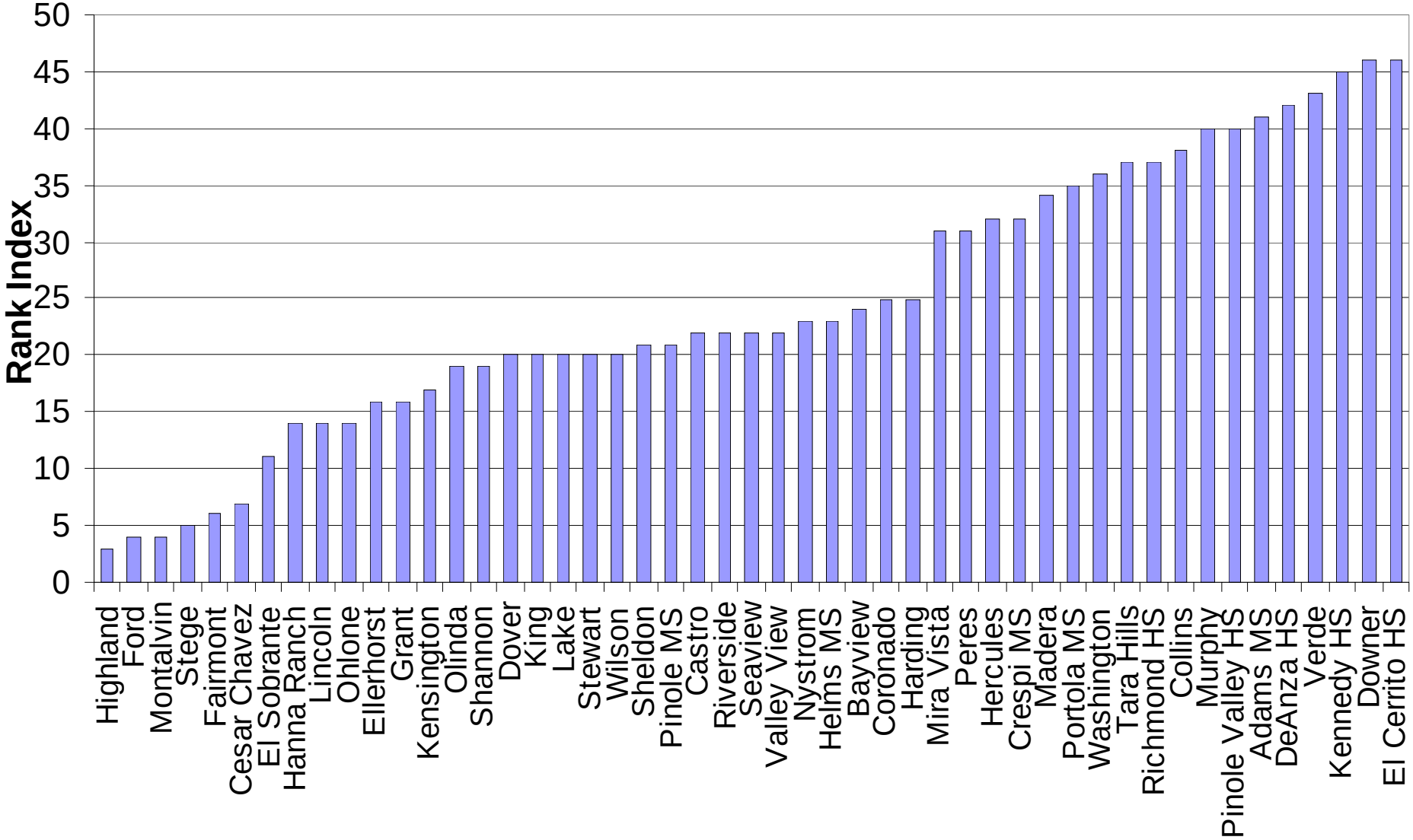
Energy Star Scores



Benchmark Comparisons



WCCUSD
Sorted Rank Index



California Energy Commission Benchmarking Workshop
Higher-Education Sector

Special Uses for Benchmarks in Campus Planning and Design:

Load Projection

- Infrastructure Planning

Building Performance Targets

- Laboratories

Building Model Calibration

Design Review

- Reality Checks

California Energy Commission Benchmarking Workshop
Higher-Education Sector
UC/CSU 1999 Benchmark Model Summary

Whole-campus energy use indices adjusted to standard case:

- all cooling loads served by electricity
- no thermal energy storage or cogeneration

Benchmarks

- Maximum Electric Demand
  - » chilled water load as fraction
- Annual Electric Use
- ?Maximum Fuel Load (e.g. Therms)?
- Annual Fuel Use (e.g. Therms)

Example: Watts/gsf = 0.85 Watts/gsf +
4.0 Watts/gsf (% Lab) +
0.067 Watts/gsf/degF (CD65)

CD65 = Cooling Design Temp - 65 degF

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References

Brown, K. 2002. "Setting Enhanced Performance Targets for a New University Campus: Benchmarks vs. Energy Standards as a Reference?" *Proceedings of the 2002 ACEEE Summer Study of Energy Efficiency in Buildings.* 4:29-40. Washington, D.C.: American Council for an Energy-Efficient Economy.

Laboratories for the 21st Century Energy Benchmarking Tool

- http://www.labs21century.gov/toolkit/benchmarking.htm

PIER "High-Performance Buildings for High-Tech Industries" Program

- Dale Sartor (DASartor@lbl.gov, 510/486-5988)

Monitoring-Based Cx Program (UC/CSU/Investor-Owned Utilities)

- Karl Brown (Karl.Brown@ucop.edu, 510/287-3330)