K–12 Schools Project Performance Benchmarks (All ASHRAE Zones)

The U.S. Department of Energy's Technical Assistance Team worked with Lawrence Berkeley National Laboratory (LBNL) and the National Association of Energy Service Companies (NAESCO) to develop this series of fact sheets to assist American Reinvestment and Recovery Act (ARRA) grantees and end-users in benchmarking energy efficiency upgrade costs and expected annual savings for municipal, state, federal government, and healthcare facilities, universities, colleges, and K–12 schools.

The values reported represent typical project costs, savings, and economics for ESCO projects in the LBNL/NAESCO project database.

We define an ESCO as a company that provides energy efficiency-related and other value-added services and that employs performance contracting as a core part of its energy efficiency services business.

LBNL/NAESCO Project Database

The LBNL/NAESCO Project Database, funded by the Department of Energy, is the largest database of ESCO project information in the world with more than 3,600 projects. The database includes information on project costs, savings, measures installed, facility physical characteristics, market segment, and location. Information for approximately 75% of the projects in the database is from NAESCO's voluntary accreditation program with information on the remaining projects provided by state and federal agencies that administer performance contracting programs.

Definition of Performance Metrics

This fact sheet reports **five major performance metrics** that can be used to benchmark proposed ESCO projects. Each performance metric is disaggregated and reported by major retrofit strategy (i.e., Major HVAC, Minor HVAC, Onsite Generation, or Other).

- **Project Installation Costs ($/ft²)**—Represents turnkey project costs, which is the total cost to install the project. Also includes all costs related to design, construction, commissioning, construction-period financing charges, but excludes long-term financing charges and effects of incentive payments.
- **Annual Reported Savings (kBtu/ft², kWh/ft², and % of baseline energy)**—Based on at least one year of actual (realized) savings and reported as (1) blended from all savings sources (kBtu)[1] and (2) electricity-only (kWh) savings. We also report project savings as a percent of a facility's total energy usage prior to the retrofit (i.e., measured baseline).
- **Simple Payback Time (Years)**—The project simple payback time is project installation costs—**with no financing charges included**—divided by the dollar value of annual energy and operations and maintenance (O&M) savings.[2]

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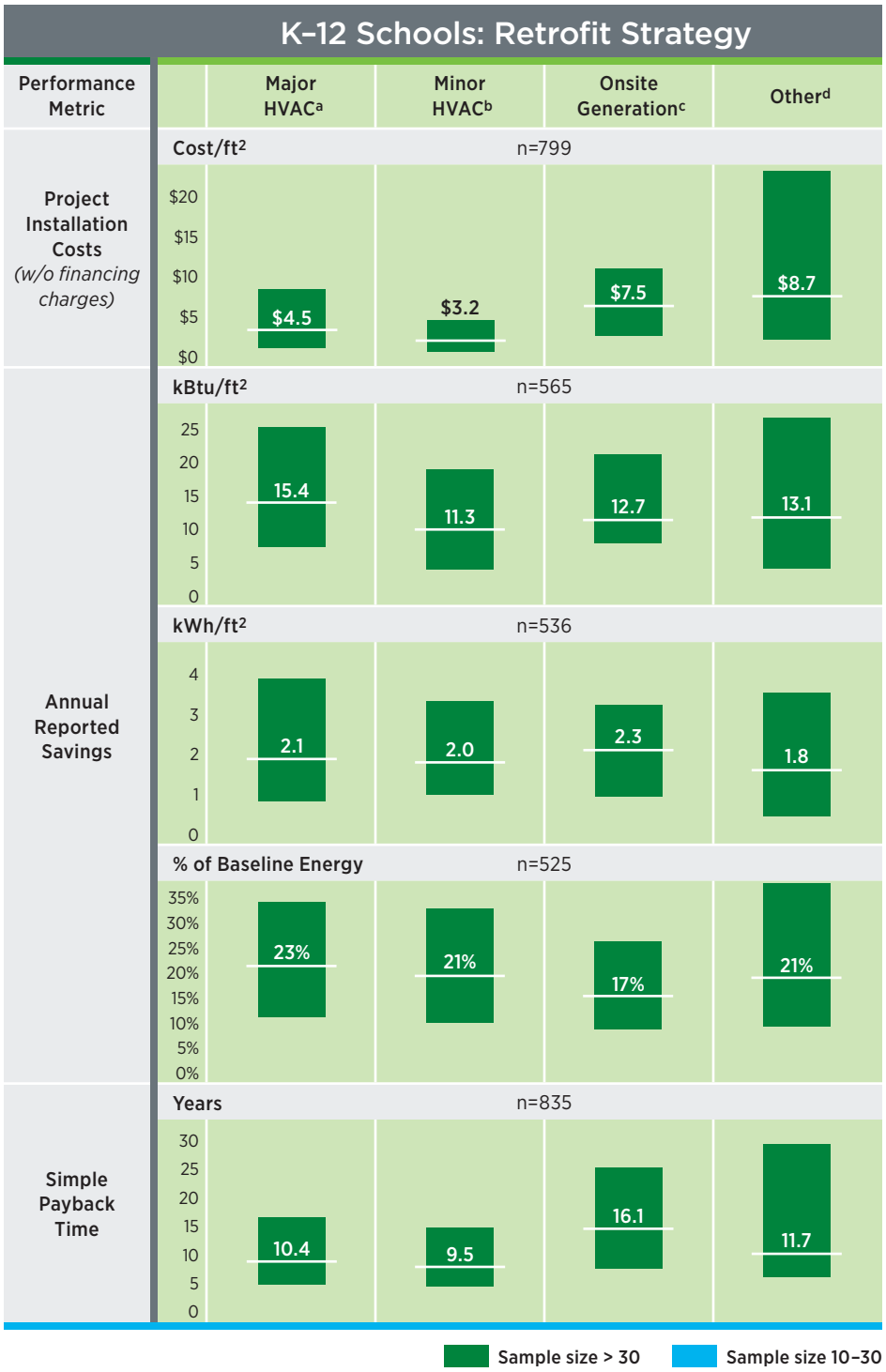
[1] *For projects with electricity savings, we assume site energy conversion (1 kWh = 3,412 Btu). We did not estimate avoided Btus from gallons of water conserved. In general, we followed the analytical approach documented in Hopper et al. (2005): "Public and Institutional Markets for ESCO Services: Comparing Programs, Practices and Performance," LBNL-55002. http://eetd.lbl.gov/ea/emp/*

[2] *Payback times quoted to the customer will be longer if financing costs are included.*

Interpreting the Performance Metrics Charts

- We report the 20th, 50th, and 80th percentile value for each of the performance metrics based on installations that occurred from 1996 to 2008 in the K-12 Schools market. Each bar is bounded at the bottom by the 20th percentile and at the top by the 80th percentile. The numerical value listed in the bar chart is the 50th percentile (the median value for all projects in that group). The bars represent the historic range for these performance indicators for projects installed by ESCOs in a similar climate zone (based on ASHRAE climate zones) or market segment (e.g., K-12 schools).
- Sample size information—Green bar color (greater than 30 projects), blue bar color (greater than 10 but less than 31 projects), and "n < 10" (no value reported because sample size is less than 10).
- ESCOs typically estimate savings from projects using an accepted method from the IPMVP protocol: measures that provide savings across an entire building often use IPMVP Option C (Whole Facility) and measures that focus on a specific equipment typically use IPMVP Option A or B (Retrofit Isolation).[3]



Technologies include:

[a] *Major HVAC equipment replacements (e.g., boilers, chillers, cooling towers), HVAC distribution improvements, and other control, lighting, and motors measures.*

[b] *Less capital-intensive HVAC measures and controls plus lighting and other measures.*

[c] *Onsite generation equipment with other energy efficiency measures (e.g., lighting).*

[d] *Domestic hot water, water conservation, other energy-efficient equipment and strategies such as vending machines, lighting, laundry/office equipment, refrigeration, industrial process improvements, staff training, and utility tariff negotiations.*

[3] *Efficiency Valuation Organization, "International Performance Measurement and Verification Protocol: Concepts and Options for Determining Energy and Water Savings: Volume 1," September 2010. http://www.evo-world.org/*

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