Bonneville Power Administration

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RESULTS FROM AN ENERGY-EFFICIENT SHOWERHEAD FIELD STUDY

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The Bonneville Power Administration (Bonneville) initiated research to determine the energy saving potential of showerheads. The research was implemented in several phases by the Pacific Northwest Laboratory (PNL). The field study designed to identify field conditions associated with the installation of, and potential savings from, e showerheads. Bonneville collected energy use data from field study participants concurrent with this field study second phase of energy savings analysis. This report is limited to the first phase field study.

A total of 150 single-family Regional End-Use Metering Program (REMP) sites were eligible for participation in thi in REMP). The sites are located in Oregon, Washington, Idaho, and Western Montana, and, although probably r representative of the region, they include a cross section of residences and occupants. To recruit field-study pa residents were offered a $40 cash incentive, free showerheads, free professional installation, and a return of tl showerheads upon request.

Savings from energy-efficient showerheads depend on several program factors, including participation in a retro replacement of high-flow showerheads with energy-efficient showerheads, and use of the retrofit showerheads Savings are dependent on field conditions, such as existing water flow rates, water pressure, and type of wate summary of field study results on these topics is provided below.

PROGRAM AND MEASURE RESULTS

The savings from retrofit programs depend on both participation in the program and installation of measures. M more than one shower. Consequently, results need to distinguish between number of homes in the program ar showerheads.

PROGRAM FACTORS

Program participation rate is the number of showerheads distributed to the program participants. Of the 150 s participate in this study, 111 elected to participate. However, seven withdrew, for a total of 105 who participate Six homes dropped out during the site visits, resulting in a 65% program participation rate. Program participatic further explained in Table S.1.

Program penetration is defined as the fraction of participants who actually had showerheads installed. Ninety- 111 households who volunteered to participate were retrofit with energy-efficient showerheads for an 88% pro rate.

Program persistence is based on the fraction of the households that installed showerheads, where at least or remained in service. After 15 months, 92 of the 98 homes that were retrofitted retained at least one showerhe program persistence rate.

Measure participation is based on the actual number of showerheads distributed compared to the total numbe installed. In this study, it is estimated that the original 150 potential participants had 240 showerheads. Of the replaced for an approximate measure participation of 66%.

Measure penetration is based on the number of efficient showerheads installed compared to the number that installed. Of the total 161 showerheads in the 98 participant homes, 158 showerheads were replaced for a me of 98% for the 98 homes and 66% for the 150 original.

Measure persistence is based on the fraction of measures that remain in service compared to the number insta showerheads that were installed in the 98 homes, 149 remained in service after 15 months for a 94% measure

TABLE S.1. Program Participation History

REMP Residential Program sites	154	
REMP '91 Survey Respondent sites	143	154 were surveyed by mail, 143 were returned (The REMP '91 is separate from the described in this report; however the same sites were used so data from REMP '91 comparisons in this report.)
REMP Showerhead Program Original Sample	150	4 of the 154 REMP sites were not eligible for program participation because they w homes or were known to have a gas water heater.
REMP showerhead sites recruited	111	111 of the 150 agreed initially to participate
Additional Ineligible homes	-6	6 of the 111 homes were dropped from the study before the site visits--either the mind or we learned the home had a gas water heater.
REMP initial shower participants (homes visited)	105	105 sites were visited
Additional Ineligible homes	-7	At 7 homes the owners changed their minds about participating or we decided not showerhead because we found nonstandard plumbing or a gas water heater
REMP showerhead	(a)	New showerheads were actually installed in 98 sites

REMP showerhead final participants	(a) 98	New showerheads were actually installed in 98 sites
Additional Ineligible homes	-7	3 had missing data and 4 had gas water heaters
REMP energy-savings showerhead sites	(b) 91	91 sites had complete sets of useable data

(a) Participation, penetration and persistence calculations are based on the 98 sample size. (b) All energy-savi are based on the sample size of 91.

FIELD CONDITIONS

Energy savings from retrofit showerheads result from reduced hot water use. This field study measured actual assess energy savings potential. Energy-efficient showerheads rated at 2.5 gallons per minute (brand name Or (brand name ETL) were retrofit in this study. Flow rates and changes are provided in Table S.2.

Energy-efficient showerheads effectively reduced water flows. However, the average 44% flow rate reduction r variation that included flow increases at 15% of the ETL sites and 23% of the Ondine sites. Low water pressure with these sites (<1.34 gpm).

Twenty percent of the participants had wells. The average water pressure for well-supplied homes was 37.9 pc inch (psi), as compared to 66.1 psi for city-supplied homes.

TABLE S.2. Average Water Flow Results (in gpm)

	Number of Showerheads (a)	Rating	Pre-Flow	Post-Flow	Change	%
ETL Sites	136	2.0	3.09	1.67	1.42	-46
Ondine Sites	22	2.5	3.89	2.55	1.34	-34
Overall	158	NA	3.21	NA	1.41	-44

(a) for 98 sites where showerheads were retrofit.

Showering frequency is another key factor in showerhead savings. Survey responses indicate showering is the bathing with 69% of the showers being used "frequently" (at least four times weekly). In sites that had 2 show replaced were said to be used frequently. In sites that had 3 showers, 52% of those replaced were said to be

MAJOR CONCLUSIONS

These specific field study results are not significantly different from results reported elsewhere in the Pacific Nor showerhead savings potential appears to be less than initial expectations--especially the finding that pre-retro close to 3 gpm rather than 5 gpm and that roughly 20% of retrofit showerheads actually show increased flows. used a very aggressive design yet managed to convert two-thirds of the potential showerheads instead of the The cumulative effect of lower-than-expected flow reductions and retrofit rates is savings that are 65-70% less anticipated 2.5 gpm flow reductions and 85-90% retrofit rates initially expected.

This field study is based on a relatively small sample of single-family homes. Results from this study are not nec representative of the Pacific Northwest region or other types of residences. Nevertheless, this research is the r comprehensive undertaken in the region to date, and represents the best source of information for Bonneville's and evaluation.