WASHINGTON STATE UNIVERSITY
EXTENSION ENERGY PROGRAM

Community Power Works for Home:

Initial Progress Report

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Prepared for:

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Acronyms and Abbreviations

CEEP	Community Energy Efficiency Program
CPW	Community Power Works
CRIF	Carbon Reduction Incentive Fund
DOE	U.S. Department of Energy
EPS	Energy Performance Score
HERS	Energy Trust of Oregon Home Energy Rating System
kWhe	kilowatt-hour electric, a kWh equivalent
PSCCU	Puget Sound Cooperative Credit Union
PSE	Puget Sound Energy
WSU	Washington State University Energy Program

Introduction

Community Power Works (CPW) for Home soft-launched February 2011, followed by full launch of the program on April 19, with an online application and web portal. Since then, the program has evolved in response to lower than expected demand and greater than anticipated challenges moving homeowners from test to installation. Since the June 2011 release of the "Community Power Works for Home: Analysis of Very Early Adopters" progress report, the CPW for Home project team has made significant changes to program design to increase demand and simplify and streamline delivery. Major changes and milestones include:

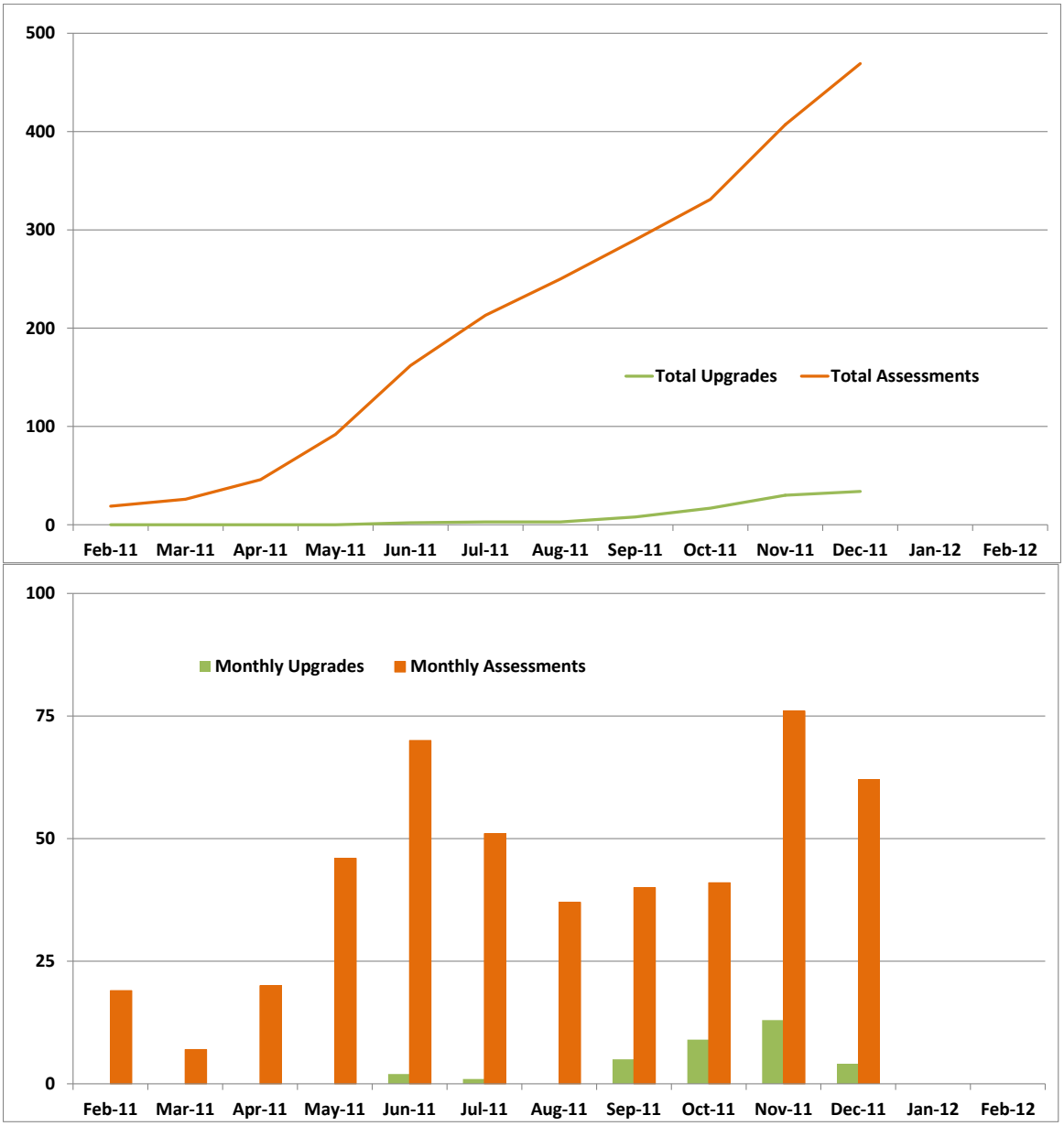
- Loan financing and the Carbon Reduction Incentive Funds (CRIF) were enhanced by:
  - Sales bonuses of $100 for auditors and flexible service contractors who signed up customers by Thanksgiving 2011.
  - $500 incentive for customers who signed up by Thanksgiving 2011, sign a bid by February 15, and complete work by April 1, 2012.
  - $500 incentive for current CPW customers who completed work by December 31, 2011.
  - Waived loan fee ($400 value).
- The roll out of a comprehensive fall marketing plan and collateral materials.
- The distinction between the full and flexible service model on the website for customers was phased out and the contractor payment structure ended on December 31, 2011.
- A more sophisticated tool for evaluating upgrade packages and estimating carbon and energy savings performance was developed and deployed to contractors.
- The CPW for Home's contractor pool was reopened and four contractors were added to the contractor pool.
- Major improvements in customer management, tracking and analytics for the CPW for Home's web portal.

This report summarizes the initial outputs and results of CPW for Home through November 2011, drawing primarily on data extracted from the CPW for Home IT platform. With the exception of Figure 1, this data was drawn on November 21, 2011, 224 days after the launch of the portal. This data provides a first look at implementation outcomes. A more detailed analysis that integrates program, participant and non-participant interviews and information on utility investments will be completed in 2012.

Summary of Assessments and Upgrades

As of December 31, 2011, 469 assessments were completed and 34 homes had upgrades installed and related test-outs completed. An additional 39 homes have passed out of the bid stage and started the upgrade process. As shown in Figure 1, which is the implementation curve for CPW Home, upgrades lag assessments. This is a typical pattern for energy efficiency upgrades during start-up of residential energy efficiency upgrade programs. CPW for Home did not meet its initial goal of 500 upgrades by December 31, 2011. The longer-term goal of 2,000 upgrades by June 2013 is still in reach.

Figure 1. CPW for Home – Cumulative and Monthly Assessments and Upgrades, Feb-Dec 2011



Interest in Loans

The demand for loans thus far has been very modest:

- 92 (15 percent) of the 634 people using the CPW for Home portal through November 21, 2011 expressed interest in a loan. This reflects a small drop from the percentage indicating interest in the first 30 days (18 percent).
- Craft3 responded to 100 requests[1] for credit checks through November 21 and approved 89 percent of them.
- Six of seven loan requests were closed. These six loans accounted for 14 percent of the 44 projects moving past the bid stage. Five of the six closed loans were standard loans (5.99 percent) and one was low-income (3.99 percent).
- An additional seven loans for projects in the bid process are in the loan-writing stage.

Loans were primarily used for financing high cost upgrades. All CPW loans were for projects over $8,000, while 22 of 44 projects past the bid stage had customer costs of under $8,000. The average loan was $13,288.

At least four participants have obtained energy upgrade financing from Puget Sound Cooperative Credit Union (PSCCU). PSCCU recently developed the Energy Smart Loan, which is a 15-year loan of up to $25,000 with a 4.74 percent interest rate.

These modest loan take-up rates are consistent with other energy efficiency loan programs. The Whatcom County Community Energy Challenge, which offers a similar loan product, has been seeing take-up rates between 20 and 30 percent, with most of the loans being used for capital-intensive projects. The combined take-up rate for both CPW and PSCCU loans is 25 percent of CPW projects.

Additional interest rate buy-downs for CPW loans may increase the attractiveness of the loan for capital-intensive projects, especially relative to the PSCCU product. While the availability of lower-cost energy upgrade loans does not appear to be a primary driver of upgrades, the loans provide an important supporting tool, especially for the most comprehensive and capital-intensive upgrades.

CPW for Home Incentive Payments

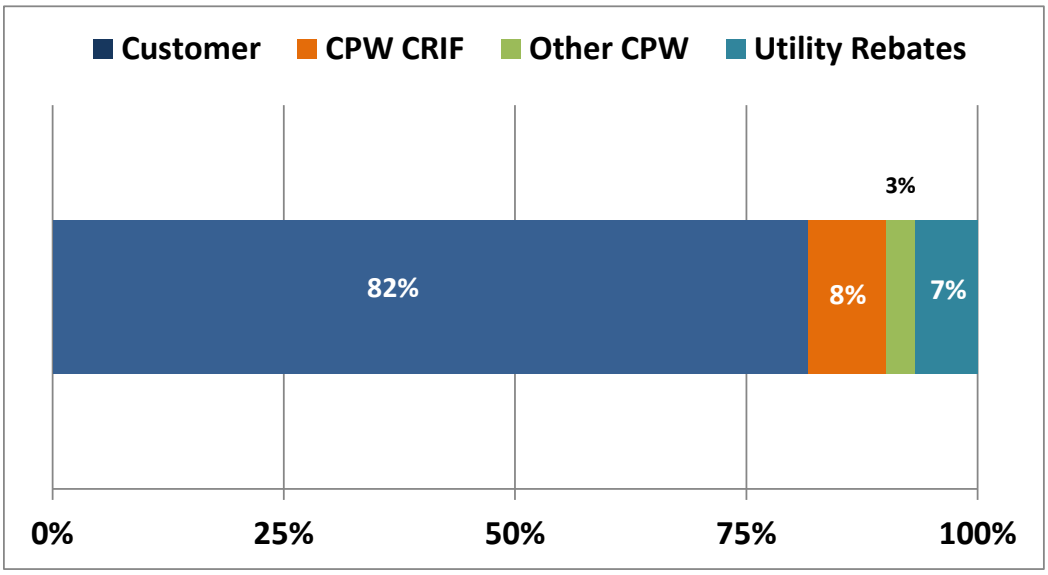
As of November 30, 2011, $59,843 of CPW for Home incentives were committed to 44 projects that started or completed upgrades.

- CRIF incentives ranged from $114 to $2,913 per home, with an average of $922.
- 25 (57 percent) of these projects included fall bonus incentives.
- Additional utility rebates were reported for 35 upgrades (70 percent). Most (86 percent) of these incentives were for gas measures paid for by Puget Sound Energy (PSE). Utility incentives ranged from $200 to $2,844 and averaged $1,007 per home. The average across all projects, including those that did not receive utility rebates, was $705.

[1] Does not equal 92 because not all of those interested in loans went to the credit check process and others entered the credit check process at other points in the upgrade project.

- Participants are paying over 80 percent of total project costs after CPW Home and utility incentives, as depicted in Figure 2.

Figure 2. Incentive Contribution to Total Project Costs



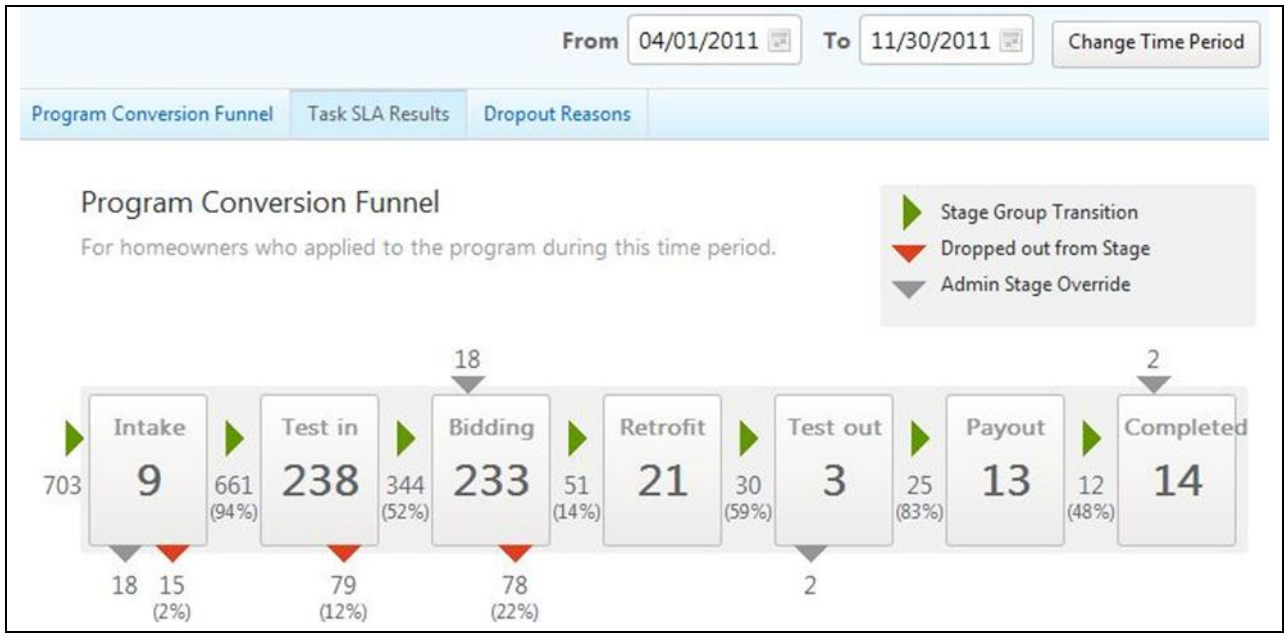
Anecdotal evidence suggests that linking incentive amounts to specific calculated carbon reductions has been challenging to implement. It is a difficult and complex concept to explain to contractors, customers and neighbors. The process of establishing, documenting and then verifying carbon reduction adds additional steps, complexity and the opportunity for miscommunication to the upgrade process.

Experience with Washington's Community Energy Efficiency Program (CEEP) suggests that rapid implementation of upgrades is associated with simpler incentive mechanisms and greater incentive levels.

Delivery Process: How long does it take? Where are the delays?

The CPW Analytics Program Conversion Funnel is a powerful tool for analyzing project operations. The Washington State University Energy Program (WSU) audited and analyzed the raw data used in this tool and found it to be generally accurate and reliable, and it continues to improve as all users become more familiar and proficient with the tool.

Figure 3. CPW for Home Program Conversion Funnel pulled from CPW Analytics on December 5, 2011



This tool is useful in indicating where participants drop out and how long they stay in each stage before advancing to the next. As of November 30, 2011, 90 percent of CPW participants who had not dropped out of the process were at the intake, test-in or bidding stages.

It is useful to look at three measures of attrition at each stage:

- Percent of total drops at a specific stage (45 percent, or 78/(15+79+78)) failed at the bidding stage.
- Percent of those entering the stage who drop out (78, or 22 percent of 362=344+18 entering the bidding stage).
- Percent leaving the stage that are drop outs (51, or 60 percent of 129=78+51).

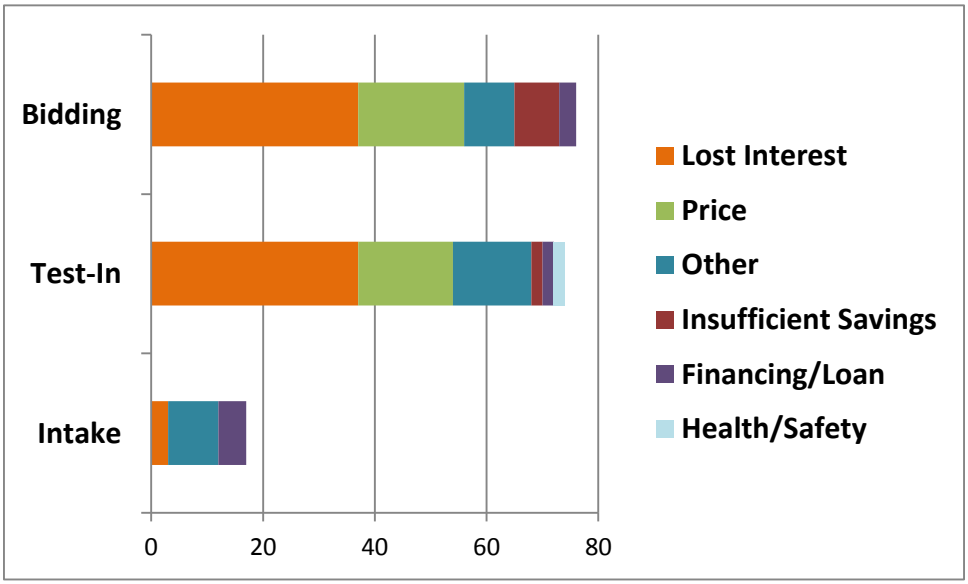
Table 1 indicates all reported drop outs occurred prior to starting the upgrade.

Table 1. Drop-Out Rates by Stage for CPW for Home

	Total drop outs (%)	Drop outs as percent of those entering (%)	Drop outs as a percent of those leaving (%)
Intake	15 (9%)	2%	2%
Credit Check	11	11%	11%
Test-In	79 (46%)	12%	19%
Bidding	78 (45%)	22%	60%
Upgrade	0%	0%	0%
Test - Out	0%	0%	0%
Rebate/Invoice	0%	0%	0%

Although there are equal numbers of drop outs at the test-in and test-out stages, there is a much higher dropout rate at the bidding stage. The most frequently reported reasons for dropping out are loss of interest and the price of the upgrade and/or amount of the rebates available. The availability and qualification for financing and health and safety concerns were cited only infrequently as a reason for dropping out. Eight projects with insufficient savings were not screened out during test-in, but this may be an artifact of early implementation. A more in-depth exploration of why drop outs lost interest or why price was an issue would be fruitful.

Figure 4. Reasons for Drop Out by Stage



The elapsed time between application and closeout for the first ten completions was between two and seven months, with an average of five and a half months. Elapsed time from start to completed upgrade is about four months.

Delays do not appear to be driven by approval of financing. The credit check process generally takes under a week. While there have been some instances of significant delays in developing and closing loans, this has affected less than 10 percent of participants.

There appears to be a one- to two-month lag between application and completion of the test-in process. Some of this delay occurs after the test-in visit as results are finalized. At least half of the total elapsed time occurs in the bid stage – the stage in which CPW for Home has the least influence. The length of time in the bid process is influenced by the:

- Number of bidders.
- Complexity of choices and decision-making associated with whole house upgrades with older homes (over half are pre-1920s vintage).
- High cost of individual projects, which can require financial juggling. Although most projects are not seeking loan financing through the program, it does take time to arrange alternate financing and manage the cash flow.

Elapsed times are expected to increase in the coming months because 82 projects have been in the bid stage for more than 90 days. The elapsed time for each stage is shown in Table 2.

Table 2. Calendar Days for Each Stage (Excluding Drop Outs)

Stage (N)	Median (days)	Average (days)	Minimum - Maximum
Start to Finish (10)	167	149	60 - 200
Start to Upgrade (23)	116	113	31 - 188
Intake (456)	1	5	1 - 163
Credit Check (75)	4	13	1 - 169
Test-In (234)	29	39	1 - 169
Bidding (41)	72	69	2 - 161
Upgrade (23)	15	23	1 - 104
Test – Out (20)	16	20	2 - 52
Rebate/Invoice (10)	15	18	1 - 47

An initial analysis of elapsed times between contractors affiliated with the full-service model (Sustainable Works, Home Performance Collaborative) did not show clear evidence that these projects were moving faster or were more likely to upgrade. Elapsed times were slightly longer. However, it is too soon to draw definitive conclusions; as sample sizes are still small, the distinction between full and flexible service models is not clear, and "full-service" contractors may be delivering more comprehensive upgrade packages.

Post-upgrade processing (test-out and payment processing) currently takes four to six weeks. This is a concern because long delays between upgrades and payments affect contractor cash flow, which can be a particular concern for small businesses. This is an area of opportunity since some of these delays may be occurring because processes are not yet fully established. The test-out process currently relies on a single auditor, which could potentially become a significant bottleneck.

Conversion Rates

One of the key measures of efficiency program success is the rate at which initial assessments are converted to completed upgrades. One of the core design premises of CPW for Home is that the tools and support provided through the web portal and by contractors would result in more assessments being converted to upgrades earlier. Conversion rates need to be assessed as a function of time.

It is challenging to establish a benchmark for comparing CPW conversion rates. Our review of residential upgrade conversion rate data from the energy efficiency program evaluation literature and recent experience with CEEP suggests that conversion rates are influenced by four main factors:

- Pre-screening: Programs with stringent pre-screening based on home vintage, last upgrades or other indicators that point to the likelihood of upgrade generally have higher conversion rates. CPW for Home's intake process collects pre-screening data but does not screen out homes for reasons other than eligibility.
- What is counted as an upgrade: Programs that count any upgrade action taken have higher conversion rates than projects targeting comprehensive upgrades. The CPW for Home/U.S. Department of Energy (DOE) standard of 15 percent savings is considered comprehensive.
- Incentive levels and financing: Programs that pay a large share of installation costs get higher conversion rates. As shown in Figure 2, the contribution by CPW for Home is fairly modest.
- The target market: Programs that target moderate-income households and those with access barriers (such as language) have lower conversion rates.

Historically, northwest regional weatherization programs have achieved conversion rates over 80 percent. However these rates were achieved over five or more years and typically involved covering more than half of installation costs.

More recent experience with three similar comprehensive upgrade pilot programs under CEEP suggests that 30 to 50 percent conversion rates at 12 to 18 months from assessment are achievable. These projects provided extensive customer support and targeted more comprehensive upgrades, and the combined program and utility incentives covered 15 to 30 percent of installation costs.

The most useful and comprehensive benchmarks are the long-term conversion rates in 2003-2009 from the Energy Trust of Oregon Home Energy Rating System (HERS) audits. This program had a similar audit tool, similar incentive levels but generally less intensive project management and support services than the CPW for Home program.

WSU staff calculated two preliminary conversion rates (percent starting contractor work) for 118 projects where more than 90 days had elapsed from test-in and 18 projects where more 180 days had elapsed from test-in. As shown in Table 3, three- and six-month conversion rates through November 21, 2011 were 9.7 percent and 27.3 percent, respectively. These initial calculations suggest that conversation rates are on track to equal or exceed similar projects.

Table 3. Audit Conversion Rates

Conversion rate:	CPW for Home EPS Audit	Oregon HERS Audits	Washington CEEP Audits
Three months	**9.7%**	11-17%	NA
Six months	**27.3%**	6-22%	
One year	NA	20-28%	30-50%
Two years	NA	25-35%	
Three years	NA	29-40%	NA
Four or more years	NA	32-44%	

CPW for Home's two-year funding window combined with the conversion lags may pose challenges for managing customer expectations, the pipeline and incentives. Assessments create significant "latent" demand 6 to 18 months in the future. Decisions to expand the service area or the availability of assessments need to be made with that latent demand in mind.

Characteristics of Participants and Dropped Applicants at Six Months

Participants and dropped applicants are profiled in Table 4. Key characteristics include:

- Almost half of upgraded homes were built before 1920. Pipeline data suggest this percentage will drop somewhat, but will likely stay above 40 percent. Homes built after 1980 are more likely to fail.
- 27 percent of upgraded homes had oil heat, 16 percent had electric heat, and 56 percent had gas heat. The proportion of homes with electric heat appears to be increasing slightly and the proportion of oil heated homes is dropping.

Table 4. Disposition of CPW Home Participants by Stage

	Participants as of 11/21/11				Close/Failed
	Total	**Pre-Bid**	**Bid**	**Upgrade Complete**	
Number	466	220	201	45	168
Want Loan	**15%**	**12%**	**17%**	**18%**	**12%**
ZIP Code					
98112 (Capitol Hill)	4%	4%	4%	7%	5%
98122 (Central)	21%	22%	20%	22%	18%
98144 (Mount Baker)	20%	20%	21%	16%	18%
98118 (Rainier Valley)	39%	**38%**	40%	**47%**	**40%**
98178 (Rainer Beach)	4%	**4%**	4%	**0%**	**5%**
98108 (Beacon Hill)	10%	**11%**	9%	**4%**	**13%**
98102	1%	0%	0%	2%	1%
Year Built					
Post – 1995	3%	**3%**	2%	**0%**	**5%**
1980 – 1994	8%	**6%**	8%	**11%**	**13%**
1960 – 1979	8%	6%	6%	**7%**	**12%**
1940 – 1959	22%	20%	27%	18%	20%
1920 – 1939	18%	18%	23%	19%	15%
Before 1920	39%	46%	33%	**49%**	**35%**
Primary Heat Source					
Electric	18%	20%	15%	16%	16%
Gas	66%	65%	69%	**56%**	**70%**
Oil	16%	**15%**	14%	**27%**	**13%**
Other	1%	1%	1%	0%	1%
Household Size					
One – Two	50%	51%	50%	**47%**	**56%**
Three – Four	42%	**37%**	44%	**49%**	**36%**
Five or more	8%	**11%**	5%	**2%**	**8%**
Delivery Model					
Full Service	33%	39%	26%	31%	36%
Flex Service	67%	61%	74%	69%	64%

Homes that drop out or are in the pre-bid stages:

- Are more likely to be located in the Rainer Beach and Beacon Hill ZIP code and are more likely to be located in Rainer Valley;
- Are built after 1980;
- Have households with five or more members; and
- Do not have oil heat.

The participant profile at six months is characteristic of "early adopters." It is essentially unchanged from the participant profile of the first 30 days. CPW for Home does not appear to be reaching households with access barriers.

- About 2 percent of applicants reported that English was not their primary language. None of these applicants have made it to a completed upgrade.
- Of the households that reported income in the application process, 52 percent had incomes over $100,000. Of households that reported income and completed upgrades, 72 percent had incomes over $100,000.

Upgrade Costs and Upgrade Depth

Initial results suggest that CPW for Home upgrades are fairly comprehensive. The average total cost of projects completed or in construction was $10,593. Figure 5 summarizes the most common measures included in bids for the 42 homes completed or under construction where we had data on bid measures.

The most common measures included in the bid process are:

- Air sealing – 34, 77 percent
- Attic insulation – 29, 66 percent
- Wall insulation – 25, 57 percent

The most common installed measures for the 26 homes reporting installed measure data are:

- Air sealing – 19, 73 percent
- Attic insulation – 14, 54 percent
- Wall insulation – 14, 54 percent

The most comprehensive upgrades include seven or eight (out of 16) installed measures. Eight, or 31 percent, of the projects had five or more installed measures. Of the 26 reported projects:

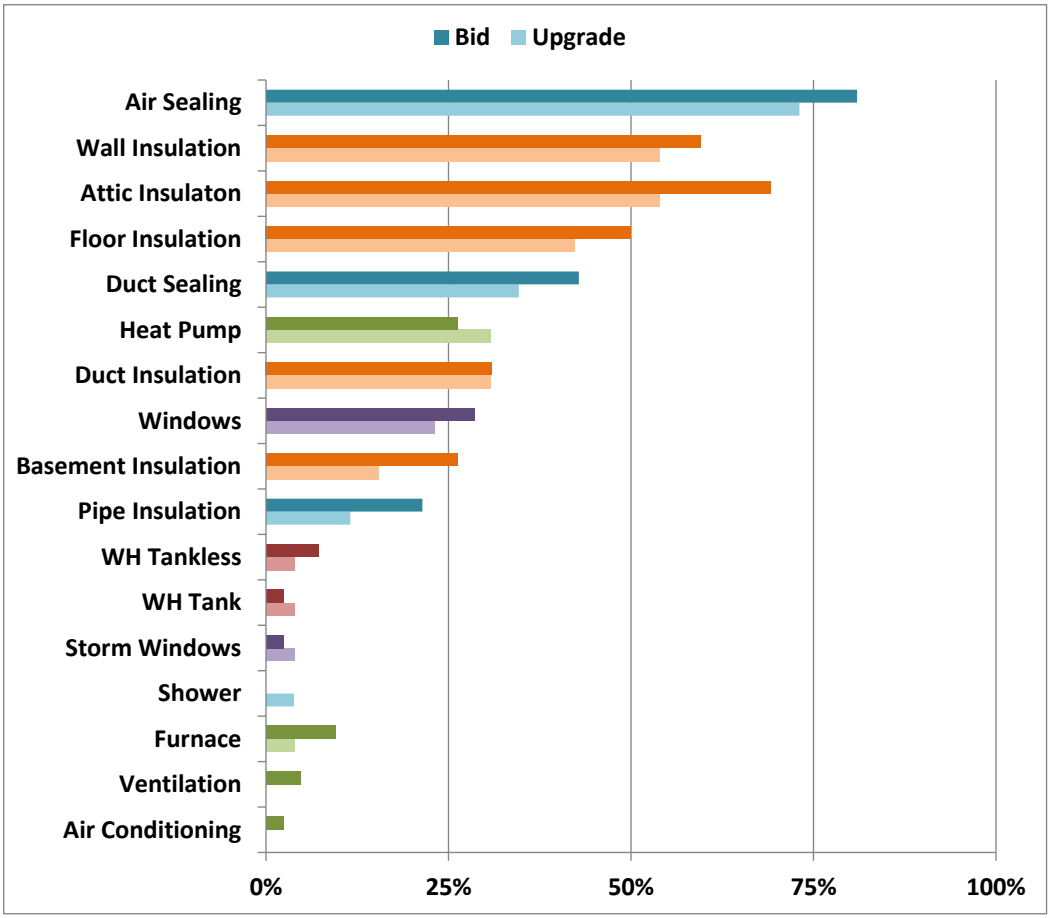
- 50 percent were insulation only,
- 19 percent were heating system change outs,
- 15 percent were insulation and heating system, and
- 15 percent were insulation and windows.

In these comprehensive upgrades, air sealing has been consistently included along with building envelope insulation measures. Attic and floor insulation was installed in all of these upgrades.

An alternative way to assess how comprehensive these upgrades were is to compare the maximum potential energy savings estimated in the Energy Performance Score (EPS) test-in with the savings estimated from the EPS test-out score[2]. For the 27 projects with both test-in and test-out scores, potential reductions totaling 441,000 kilowatt-hour electric (kWhe) were identified. Test-out scores estimate that 248,000 kWhe – or 56 percent – of the potential identified during test-in was captured. Further analysis is needed to assess what is responsible for this gap.

[2] CPW for Home relies on the EPS to estimate energy, cost and carbon savings. At test-in, the EPS generates an estimate of current energy use by fuel type and calculates a score in kWh equivalents (kWhe), the Energy Performance Score. An estimate of the potential EPS if all measures identified in the audit were installed is also generated. At test-out, the EPS is recalculated based on the measures installed. The EPS is designed to provide a quick assessment, not precise estimates, of actual savings. Contractors supplement the EPS score energy-savings calculations with the CEAR tool, which allows customization and refinement of input assumptions. Some upgrade packages that do not exceed 15 percent savings via EPS may qualify using CEAR calculations.

Figure 5. Measures Installed (% of Completed Projects – n =26) and Measures Bid (% projects completed or in progress where it was included in the bid- n = 42)



Energy, Cost, and Carbon Savings

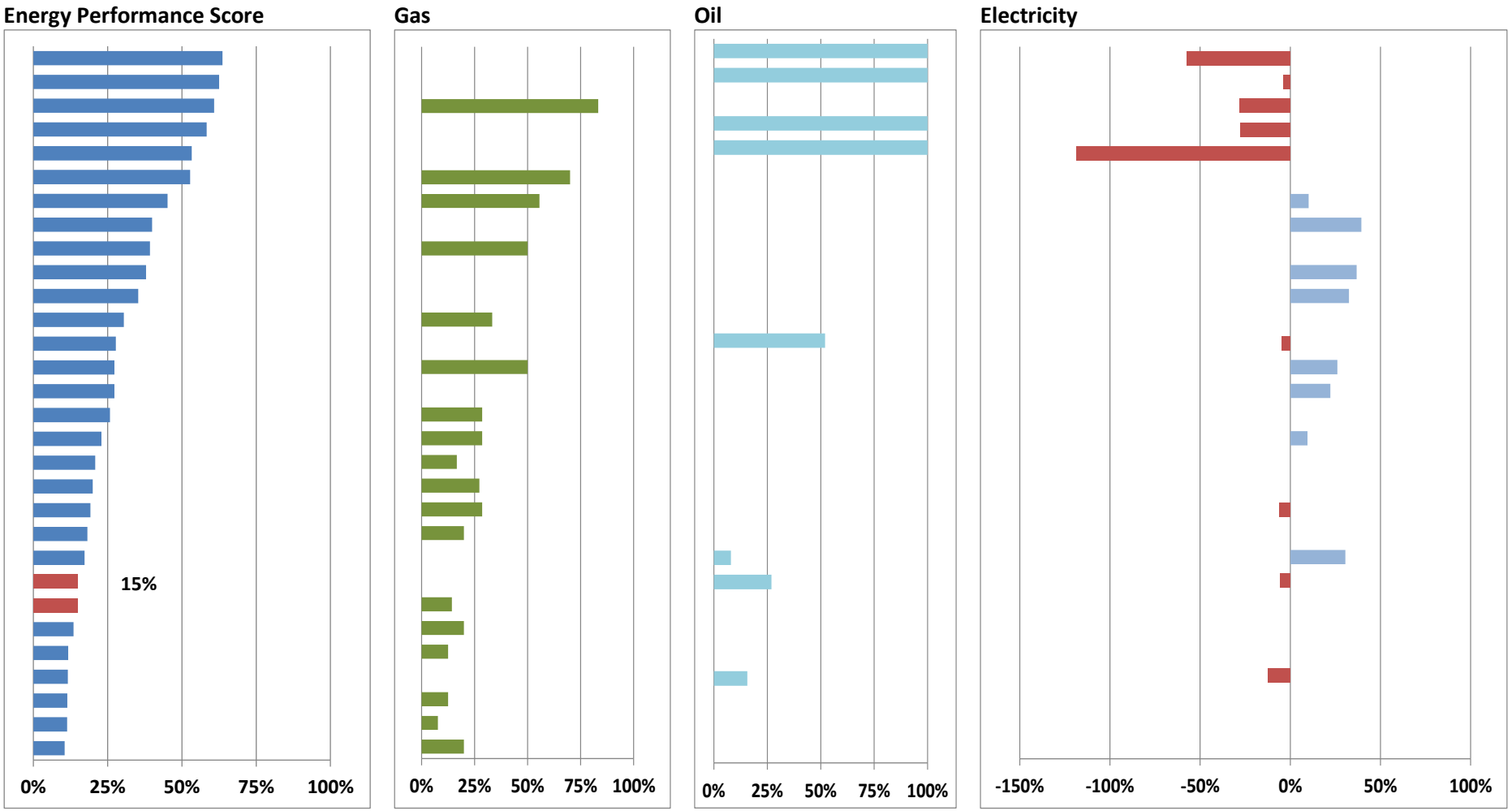
The total annual estimated savings for the 30 homes that completed an EPS test-out as of November 30, 2011 were:

- 61 tons of carbon (a 20 percent reduction)
- 276,000 kWhe (a 30 percent reduction)
  - 4,800 therms (a 30 percent reduction)
  - 2,880 gallons of fuel oil (a 66 percent reduction)
  - 13,200 kWh (a 5 percent reduction). Low electric savings are the result of four heating system change outs from oil to electric, which increased the electric load but significantly reduced carbon emissions and customer energy costs.
- $15,560 in annual energy savings

As shown in Figure 6, EPS reductions ranged between 10 percent and 64 percent. A total of 6 of the 30 completed projects had estimated savings below the program threshold of 15 percent using EPS scores. It is likely that most of these project meet the 15 percent threshold when savings estimates are refined using the CEAR tool. We currently do not have access to this data. The inconsistency between EPS calculations and savings and incentive estimates developed through the CEAR tool during the bidding process has caused some confusion with customers.

Figure 6 also highlights that the greatest EPS reductions are associated with oil heating system replacements, which increase electric loads.

Figure 6. Estimated Annual Percent Reduction in Energy Performance Score and Fuel Source



Summary

- While the initial goal of 500 upgraded homes by December 31, 2011 was not reached, significant efforts and successes have been realized to build capacity of the workforce and refine tools used in the program.
- The loan program is underutilized but take-up rates are consistent with other energy efficiency loan products. Loans are used primarily for high-cost projects. Low loan take-up does not appear to be linked to process times or high rates of disqualification. Further investigation is needed to determine whether low demand is related to loan terms and design, availability of alternatives, or general aversion to loans.
- Most participants who drop out in the test-out and bidding stages cite price and loss of interest as the primary reasons. Dropout rates in test-out could be reduced by tighter screening (for example, screening out homes built after 1995). Further investigation would be beneficial to determine what tools, training, and/or support could be offered to reduce dropouts. The CRIF-based incentive structure requires the test-in audit to determine incentive amounts. Customers do not have information on incentive levels, an important consideration, prior to program application. Actual incentives may be lower than expected and may discourage participation.
- The initial completions are taking about six months from sign-up to pay-out. The elapsed time is expected to increase based on the "age" of homeowners still in the bidding process. Much of the delay is occurring during the bidding process. These delays are driven by a combination of factors including the extent of the upgrades, the complexity of the bidding process, and efforts to get homeowner decisions and schedules to line up. Extra incentives, sales training and other processes may reduce elapsed times in the bidding stage somewhat, but the bid stage is the stage that is least subject to the program's control. There do appear to be opportunities to reduce process times during the test-in, test-out and payment process stages.
- Upgrades are achieving an average of 30 percent reduction in Energy Performance Scores. Air sealing installed in combination with two building envelope insulation measures are consistently seen in the comprehensive upgrade projects. Average project costs are over $10,000. This suggests that CPW for Home is stimulating deeper retrofits.
- Although homeowners are making significant investments, test-out scores indicate that 56 percent – over half – of potential energy savings are being captured from the test-in estimates. With program emphasis on comprehensive upgrades resulting in a 15 percent total energy use reduction, further investigation should be completed to determine what measures are not being taken and how to capture additional estimated energy and carbon reductions per project.
- While it is too early to make definitive statements on audit-to-upgrade conversion rates, the 3- and 6-month conversion rates seen thus far in the CPW for Home program are encouraging and appear to be on target with similar residential upgrade programs in the region.
- CPW for Home conversion rates are particularly notable, given CPW incentives typically cover less than 20 percent of project costs. The CRIF structure can be complex for contractors to explain and for homeowners to understand. High audit conversion rates and rapid take-up of incentives in similar residential upgrade programs has been linked to simple incentive structures and generous incentive amounts to offset total project costs.