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Appropriate Drain Water Heat Recovery Energy Efficiency Incentive Program Design

Any properly designed utility or governmental energy efficiency (e.g. DSM) incentive program recognizes, where possible, energy saving performance of the class of systems that it is targeted toward. General public knowledge about Drain Water Heat Recovery (DWHR) technologies is quite weak therefore it is especially important to consider performance differences in DWHR technologies and installation; without such consideration the integrity of the program and the public will not be sufficiently protected.

For residential programs there must, of course, be an appropriate balance between the degree of differentiation for incentive levels and complexity of the given program. There is already a very good body of applied and field research on DWHR systems. This research has made it clear the performance of DWHR systems available on the market varies greatly, depending upon:

- 1) the Manufacturer,
- 2) How the DWHR unit is installed (equal flow vs. unequal flow)
- 3) Size of DWHR unit and

In fact, in a recent study by Natural Resources Canada** in which a limited number of units were tested the first two factors caused a performance difference of about 2 times. When considering the 3rd factor and the broader range of units currently sold the full performance range difference is 3 to 4 times. That is, a unit reasonably available with the highest performance and installed for equal flow can save up to 4 times more energy than the lowest performing unit that is installed for unequal flow.

Some programs have taken a “one size fits all” approach for incentives. There are several key problems with this approach:

- higher performing units are not recognized as such
- low performing units are not recognized as such
- an incentive is still provided for very low performing units
- the consumer is not appropriately educated about the impact of installation (equal vs. non-equal flow) and DWHR unit model upon energy performance
- the consumer is not encouraged to purchase higher performing units which will deliver more energy savings
- the incentive has, in the extreme case covered almost 100% of the capital cost of smaller low performing units (NOTE: this is not an issue for a limited period of time such as in a tightly managed market transformation program)
- utility or governmental reporting of actual energy savings may be skewed to lower energy savings or reporting will be more uncertain thereby limiting the reporting on actual effectiveness of the program

Another approach that can be taken in program design is to have a cut-off performance and not allow any DWHR units below that one cut-off. This is not a good idea because it will limit the market uptake because a large proportion of homes require smaller units out of necessity. To counteract that issue one can simply set the cut-off very low but that leads to the same problems as a “one size fits all” approach. The better blend of approaches is to have 3 incentive ranges, the level of the lowest incentive range of which will constitute the lowest cut off.

The other cut off that could be implemented is to not allow single coil units or not allow high pressure loss units (e.g. loss greater than 3psi at 9.5lpm in Canada and 2.25gpm in the US). This cutoff, however, need not be taken either as will be demonstrated.

PERFORMANCE DIFFERENCES

It is first very important to recognize that single coil DWHR (first generation) units are installed for unequal flow only and that dual and multi-coil units are installed for equal flow. Installing single coil units for equal flow results in moderate to extreme flow problems in homes because of the very high pressure loss imposed. The result of installing for non-equal flow is that single coil units have a reduced effective performance or Operating Efficiency of at least 21%. Unfortunately, the ecoENERGY program in Canada does not currently recognize this difference but instead wrongly takes an average between the two scenarios. The dual-coil and multi-coil units are available from all manufacturers but some wrongly market the single coil units as having the highest performance.

Each manufacturer or manufacturer’s representative submitted two model types to NRCan/CCHT for two sets of very detailed testing which were reported in two studies concluding in July 2007. The current Canadian ecoENERGY program is wrongly based upon the performance of this limited set of units and the 2 incentive levels created were arrived to encompass the Testing Efficiency of all units submitted. Despite the deficiency of the current ecoENERGY program incentive methodology it is still best, as much as possible, to follow the program design of ecoENERGY with a few simple changes in order to make a given incentive program as defensible as possible.

Long Term Incentive Program Level and Metrics							
	Nominal Operating Efficiency	Low Operating Efficiency	High Operating Efficiency	Recommended Long Term Incentive	Incentive per Efficiency Percentage Point	Typical Total System Cost	Incentive as Percent of Total Cost
Low Range*	36%	30.0%	41.9%	\$100	\$2.78	\$870	11.5%
Mid Range	48%	42.0%	53.9%	\$130	\$2.71	\$970	13.4%
High Range	60%	54.0%	----	\$165	\$2.75	\$1,070	15.4%
For single coil units, the Operating Efficiency shall be 0.79 * Testing Efficiency							
For dual-coil and multi-coil units the Operating Efficiency equal the Testing Efficiency							
*Do not incent DWHR Units with Operating Efficiency < 30.0%							
Limited Term and/or Market Transformation Incentive Program Level and Metrics							
	Nominal Operating Efficiency	Low Operating Efficiency	High Operating Efficiency	Recommended Limited Time Incentive	Incentive per Efficiency Percentage Point	Typical Total System Cost	Incentive as Percent of Total Cost
Low Range*	36%	30.0%	41.9%	\$185	\$5.14	\$870	21.3%
Mid Range	48%	42.0%	53.9%	\$250	\$5.21	\$970	25.8%
High Range	60%	54.0%	----	\$310	\$5.17	\$1,070	29.0%

Effect of Canadian ecoENERGY Program on Market Uptake

After almost 1 year since the inception of the Canadian ecoENERGY program there has been almost zero uptake of DWHR systems. This is a result of early and current mistakes with the program design as well as very little accompanying educational literature. The key mistake is that the incentive level is not in proportion to energy performance relative to Solar Water Heating and On Demand Water Heaters; the net effect is that DWHR has been overlooked as an opportunity by evaluators and homeowners. GazMetro's Energy Efficiency Fund has found that it is very important to support a program with appropriate consumer based marketing information. Finally, most Canadian homeowners that decide upon retrofitting a DWHR unit into their home will not be going the ecoENERGY route because of the upfront costs and cumbersome nature. Any utility program can currently assume a free ridership rate as low as 0%.