Investment Technology Resources, Inc.
Public Input Response
Concerning
Water Saving Devices

June 16, 2011

This filing is in response to the Executive Board's call, in paragraph 56 of its sixty-first meeting report, for public inputs to facilitate the further development of a draft methodology for low-flow showerhead hot water saving devices, on issues identified in Annex 1 and Annex 2 of the report of the thirty-first meeting of the Small Scale Working Group (SSC WG).

Background of ITR's Response

Investment Technology Resources, Inc., (ITR) is the parent company of proponents who are developing projects utilizing water saving devices. ITR has been seeking for the last 9 months in several filings accommodation of water saving devices under the methodology AMS-II.C. *Demand-side energy efficiency activities for specific technologies*.[1] In this effort "water saving devices" has meant showerheads and faucet fixtures, which include faucet regulators added to faucets fixtures.

ITR also an applicant in the establishment of a Gold Standard water saving device methodology covering showerheads and other water saving products.[2]

Confirmation of applicability, conservatism, and reliability can be achieved under a traditional CDM methodology approach using a combination of one-time measured values, available existing use data and studies, and periodic statistically valid DOE sampling of key installation and demographic data. Unfortunately, our efforts have been delayed and now overtaken by a 'reform' initiative to establish new methodologies using global default values. While laudable, that initiative should not "throw the baby out with the bath water." In the case of our baby -- water saving devices -- moving forward using the established energy efficiency methodology would be efficient, comprehensive, and speedy.

We previously have edited two conservative methodologies that the SSC WG dismissed without any substantive critique.

Instead, our efforts have resulted in this initiative, which we consider a needless and costly derailment with an uncertain quality outcome. Now we are faced with a proposed all-new methodology that is in many respects less comprehensive and accurate, in other aspects inappropriately overreaching into device design and commercial aspects beyond appropriate methodology scope, and which has been proffered without supporting analysis or field experience.

Due to the several impending 2012 deadlines, we are constructively and in good faith providing public comment on the proposed methodology in the hope that a viable methodology can be salvaged in time to implement the worthy activity we have been pursuing.

[1] See SSC_519, SSC_500, and SSC_473. We submit by reference our submittals in those proceedings.
[2] Click here for the Gold Standard methodology.

Reponses to Annex 1 Draft and Annex 2 Queries

We have ordered our responses generally following the Annex 2 queries. However, we have included comments about additional aspects of the Annex 1 draft methodology at appropriate points. After the Annex 2 queries, we have substantial sections addressing faucet fixtures/regulators and the $EFF_{Default}$ value.

1. The SSC-WG has prepared a top-down draft methodology for low-flow showerhead hot water saving devices. This methodology is for determining emission reductions associated with reduced water heating requirements based on installation of low-flow showerheads in residences. Although this methodology in its current structure is limited to low-flow showerheads, but could be adopted to other water saving devices if adequate, reliable and conservative data and methods for determining usage patterns for applications are proposed.

Water saving faucet fixtures/regulators should be included in the initial methodology. From a technical perspective they are very similar to low-flow showerheads, require the same methodology processes and procedures, and on a household basis have nearly as significant efficiency benefits. Like for showerheads, water agencies have established performance standards for faucet fixtures. For project implementation, it is imperative to be able to use both technologies to lower per appliance installation costs, leverage household access, and maximize water, energy, and emission savings. Given the 2012 deadlines, a delay addressing faucet fixtures may severely limit the utilization of this methodology.

Installing efficient faucet fixtures/regulators is a recognized material method of saving significant volumes of water without material service quality degradation. Examples of water agency standards for, and promotion of, faucet fixture and regulators include:

- Australia – WELS program (Water Efficiency and Labeling Scheme). Faucets and regulators are testing, rating, and labeling standards, with regulators covered on a voluntary basis. http://www.waterrating.gov.au/products/index.html
- Mexico – Mexico's Comisión Nacional del Agua (Conagua) has completed a draft rule awaiting final ministerial signature that provides standards for faucets fixtures/regulators "…without losing comfort for the user's…" (ANTE-PROY-NMX-AA-000-SCFI-2010). (Submitted as an attachment.)
- United States – the Environmental Protection Agency (EPA) has faucet (bath only) and regulator testing, rating, and labeling standards on a voluntary basis. http://www.epa.gov/WaterSense/products/bathroom_sink_faucets.html

2. The methodology presents two options for calculating certified emission reductions: use of a default energy savings value for water heating energy savings (per showerhead) and a monitoring approach. The monitoring approach calls for, in a sample of installations during the year of project implementation: (a) One-time measurements of project and baseline showerhead flow rates; and (b) Shower water consumption measurements for at least two, thirty-day periods. This monitoring approach is defined, versus the use of just one time flow rate measurements and self-reported shower usage information because research indicates that self-reported shower usage data are unreliable.

If there are concerns related to the default value method that delay action, we strongly urge moving forward with a measured data methodology. In light of the 2012 deadlines, it is especially important to

promptly establishing a methodology. We see more potential debatable issues related to the 'Default Energy Savings Value' method than with the 'Calculated Energy Savings Value Using Measured Data' method. Do not let the attempt to establish an all-encompassing global default value block establishing a measured data based methodology.

Generally speaking, we seriously doubt the efficacy of such a worldwide all-encompassing $ES_{Default}$. It is our view that the proposed global default energy saving value for $ES_{Default}$ covering all variables has inherent uncertainties because the wide range in regional situations as to underlying variables (e.g., incoming cold water temperature, ambient temperatures, water pressure).

A significant improvement we urge is a modified approach for $ES_{Default}$ that involves globally fixing some underlying variables, but establishing other variables based on data applicable to a project region.

For example, $ES_{Default}$ should be established on a per person basis instead of a per showerhead basis as proposed. The household occupancy rate variable can be monitored in a straightforward fashion throughout the crediting period.

A second improvement we urge is to include, within the default value method, the option to seek establishment within the validation process of a default value specific for the project or regional area. It is our experience is that, on a regional and local basis, water agencies and other sector participants have significant well-grounded knowledge about water appliance usage, including showerheads, faucets, and regulators. Participants should have the option to demonstrate that a project or regional assumption is adequate, reliable, and conservative.

3. The SSC WG agreed to request the Board to launch a call for public inputs on the draft methodology and whether it represents a viable and conservative CDM small scale methodology and if the project proponents can use it for projects and PoAs. To this objective, the SSC WG is looking for feedback on:

(a) Is the default value of 0.2 MWh of energy savings per low-flow showerhead a conservative and reasonable value? Will this value provide sufficient incentive for low flow showerhead projects under the CDM given the cost of showerheads, the cost of direct installation, and other program costs as well as the availability of other funding sources to cover such costs? If not, what value would be recommended and what is the basis for this recommendation?

Question 3(a) concerning the proposed energy saving default value $ES_{Default}$ should focus whether it is a conservative and reliable default of carbon emission savings, not centrally on the project installation economics as is proposed. As queried, it appears that the default value is being driven by achieving a targeted project economic value.

The proposed variables Underlying $ES_{Default}$ have not been supported. The supporting information for SSC WG's proposed $ES_{Default}$ remains secret despite our request for that information several weeks ago. Consequently, the proposal provides no rationale for the variable underlying $ES_{Default}$. The bases for all key proposed variables should be transparent and public. Absent that, one should give reduced deference to the suggested values.

While the basis for the SSC WG conclusions has not been revealed, it seems they must be based on an affluent developed region with lower density per shower stall (e.g., Germany) – which is not where one

would expect to implement a CDM project. (see submitted spreadsheet "*measured_values_backed into default value.xlsx*".) Essentially, as proposed the default energy savings value discriminates against higher density households as often found in lower income developing market urban areas.

The specific proposed variable values underlying $ES_{Default}$ (see Annex 1, footnote 3) are wildly low. We say this based on data with which we are familiar and with many reports.

Fixing the shower time at 5 minutes is unreasonable. It would be conservative and supported to use 8 minutes. Here are several credible study examples:

- AWWARF Residential End Uses of Water Study (1999). The report can be downloaded at http://www.waterrf.org/Search/Detail.aspx?Type=3&PID=241&OID=90781. This is the largest study of its kind and covering U.S. and Canada. It is a standard reference for urban water professionals. Results: The average shower used 17.2 gallons and had a duration of 8.2 minutes. (Another finding: residents ran their faucets an average of 8.1 minutes per capita per day.)
- USAID (2000) Assessment of Water Saving Devices Sector in Jordan, available at http://pdf.usaid.gov/pdf_docs/PNACR022.pdf. The report cites 10 minutes for private showers by guests and in faculty housing, which is analogous to households. It references 6-8 minutes as to shower times of hotel employees in group showers.
- Waterpik Behind the Shower Certain (2009). This survey found that shower times averaged 14 minutes for women and 12 minutes for men. http://www.waterpik.com/newspress/Behind_the_Shower_Curtain.html.

A 'sanity test' of the proposed energy saving default value indicates the SSC-WG proposal is wide of the mark for Mexico, and why $ES_{Default}$ should be established on a per person basis instead of a per showerhead basis. In Mexico, government figures indicate that the national average public housing density is roughly 3.7 persons per public housing household having 1 shower, and in Mexico City that density is approaching 5 persons per household. Using the proposed energy saving default values implies that nationally each public housing resident is taking a shower about every third day and that in Mexico City each person showers about every 4 days, whereas the reality is closer to one shower a day.

The number of showers per person per year, which should be incorporated into $ES_{Default}$ should be set in the range of 336. This is based on the assumption that people take a shower a day and are away 4 weeks a year. This is the value used by Myclimate, a proponent of a voluntary project in Switzerland which successfully installed 5,500 water saving kits in homes. It was verified by a DOE. (http://www.myclimate.org/en/carbon-offset-projects/project-switzerland/detail/mycproject/99/96.html). A very conservative assumption would be 320.f

The proposed values are not reasonable from a project economics perspective. It is relevant to consider the practical result of methodology calculations. In that regard, an additional consequence of the variables underlying the 0.2MWh default value being so wide of the mark as to energy savings is that the option is commercially useless. **The practical result is to provide about $1 per showerhead per year.** (See the submitted spreadsheet "*Default_Values.xls*".) That doesn't even cover the marginal cost of pursuing CDM registration. Unless the underlying variables and approach is significantly modified, this option might as well be dropped.

(b) Should the methodology require that there be a maximum flow rate allowable for a low flow showerhead, for example nine litres a minute? Should the methodology require that there be a minimum difference between the baseline and project showerheads flow rates, for example one litre per minute? Should the methodology specify a minimum flow rate for the baseline showerheads? If so, what values would be recommended and what is the basis for this recommendation?

We advise against setting a maximum flow rate in the methodology, as it is best left to water agencies setting standards.

Setting a minimal measured flow rate improvement is a low-tech way to insure conservatism in the measurement of water savings at installation.

Using actual minimum flow rates rather than a specified minimum flow rate for baseline devices can be viewed as a conservatism element.

(c) Is the requirement that low-flow showerheads must contain integral, non-removable flow restrictions and come with a one-year warranty reasonable, and if not, what recommendations would be suggested to ensure that such devices are of relatively high quality, do not simply involve the insertion of plastic flow restrictors, and/or are not easily disabled?

It should not be a requirement that water saving devices contain integral, non-removable flow-restrictors. Rates of disabling or removal of flow restrictors can be statistically verified just as full removal can be statistically verified.

There is no technical reason to be prejudice against insertion of plastic flow restrictors. They can be effective water saving devices, some are engineered to be dynamic across a range of variable pressure situations for the specific local conditions, and water agencies test and certify flow restrictors under ecological/efficiency standards. See the examples cited earlier above.

The methodology should not include a warranty requirement or the other warranty related details proposed in methodology footnote 1. Warranty terms have not been specified in other energy efficiency methodologies such as AM0046 concerning CFLs.

Including such matters is overreaching into the commercial details not central to carbon emissions savings. During the course of the project, approved DOE verification auditing activities will address installation monitoring over the project life.

(d) Should a third-party testing and/or manufacturer certification of the low-flow showerhead's flow rates be a requirement of the methodology?

The only such water saving devise testing specific to the project activity should be if necessary to qualify the device to applicable standards (as already provided in proposed paragraph 4(a). Normally this would have been done independent of the project activity.

(e) The minimum temperature allowable for cold water supply to the water heating system is 10^{o}C and the maximum temperature allowable for showerhead water outlet is 40^{o}C. Are these conservative and

reasonable values and if not, what value would be recommended and what is the basis for this recommendation?

It is appropriate to cap $T_{out,measured}$ at 40^{o}C because this is an upper water heater bound set for human safety.

It is NOT appropriate to set arbitrarily a minimum of 10^{o}C minimum or any other present value for $T_{in,measured}$. The incoming water temperature is an easily measurable fact. It is what it is.

(f) Is the monitoring approach defined in the methodology reasonable and cost effective, and if not, what would be recommended and what is the basis for this recommendation?

Since issuance of the draft methodology we have been investigated with water appliance and metering suppliers to determine what is feasible. We believe we have found a viable metering solution at the showerhead.

However, as detailed in our final section in our comments, it is not feasible to meter individual faucet fixtures/regulators.

Additionally, we've determined it is not feasible to meter hot water centrally. We experimented with metering near the water heaters during our 100 household pilot program. We experienced significant installation and meter maintenance problems, and a number of water heaters failed due to the meters. Since issuance of the draft methodology we investigated high quality meters required to be installed near the hot water, but discovered that they cost a prohibitive 200+ Euros.

See our last comment section for more discussion of this matter.

(g) Is it appropriate, as assumed for the monitoring approach, that the number and length of showers (minutes per shower) is the same before and after the installation of the low-flow showerhead? That is, can it be assumed that the decrease in flow rate does not change the showering effectiveness or patterns?

An accepted water saving device provides equivalent performance per the applicable standard. This is that important aspect of including qualification under a standard. Otherwise, the only important measurement would be flow rate.

(h) Would it be practical and perhaps more reliable to use a control group approach for determining energy savings from the installation of showerheads, and perhaps other water saving devices? A control group approach would involve comparing the annual energy use, in real time, between the participants in the CDM program and a group of nonparticipants with characteristics same as the participants (other than use of water saving devices);

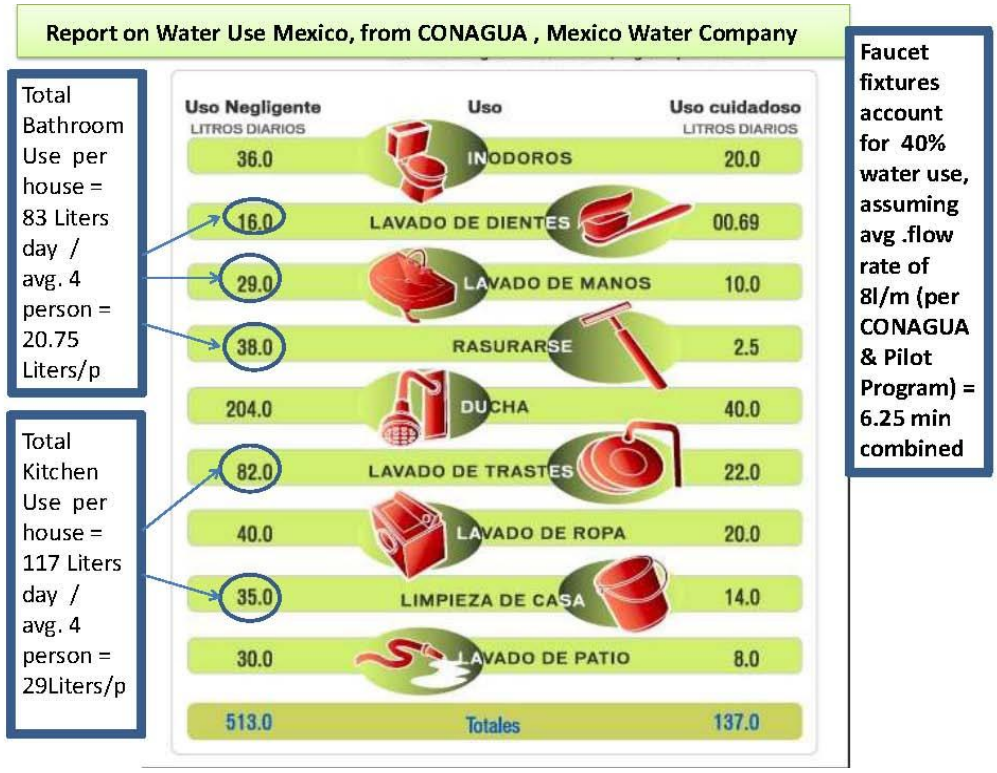
This would be an unnecessary complication and expense to require such an ongoing, real time undertaking. A CDM project is not a research project. A periodic metering approach (e.g., along the line as proposed) is sufficient.

(i) Are there any special requirements that should be imposed for PoAs?

No.

Incorporating Faucet Fixtures/regulators into the Methodology

Faucet fixtures in kitchen and bathrooms account for 40% of water use in Mexican households. Below are the results of a study done by Conagua (Mexico's federal water authority).



The SSC WG has dismissed, apparently arbitrarily, "the use of just one time flow rate measurements and self-reported shower usage information because research indicates that self-reported shower usage data are unreliable. " What studies and basis does the SSC WG have for this conclusion? As evidenced by the example studies and industry practice we've cited, the water sector relies on sample measurements and self-reported surveys for many significant actions.

This is a very important point for faucet fixtures/regulators. Our research indicates that periodic direct metering of shower heads along the lines proposed is plausible, but direct metering of faucet fixtures in kitchen and bathrooms is extremely expensive and extremely difficult to install and maintain. This is mainly due to the location and plumbing details of faucet fixtures.

However, given the data that can be assembled, it is reasonable to allow alternative methods to determine water faucet usage.

In a program in Switzerland, MyClimate successfully installed 5,500 water saving kits in homes (http://www.myclimate.org/en/carbon-offset-projects/project-switzerland/detail/mycproject/99/96.html). To determine water use and savings, Myclimate used direct

surveys, cross checked versus total water meter, worked with federal water authorities do determine water usage by type of water saving device. This approach and the results were verified by a DOE as reliable. In that study, it was found that each faucet fixture was used about 5 min per person per fixture per day. Martin Jenk, the MyClimate program manager, can be available to discuss this; his telephone number is +41 (0) 44 500 43 50).

For our program, we have an extensive and comprehensive plan for verifying 100% of the direct installs and monitoring the key variables and "bracketing" a conservative carbon savings. We plan to complete a PDD that establishes a baseline and monitoring periods that is a transparent and conservative manner (paragraph 45 (b) of CDM modalities and procedures) which means that assumptions are made explicitly and choices are substantiated. As approved in EB 55 Report Annex I, the Verification and Validation Manual provides requirements for DOE to insure PDD sufficiency at validation and the monitoring quality at verification.

It would be an outrageous error to exclude faucet fixtures just because the SSC WG without justification, without clarity as to what would be acceptable, and against water sector practice, rules that " other water saving devices if adequate, reliable and conservative data and methods for determining usage patterns for applications are proposed". Apparently, the metering option proposed by the SSC WG isn't even acceptable. What if we did put water meters on faucet fixtures? Would this meet the requirement?

One size does not fit all globally. For example, in Mexico City of the 2 million billed residential customers only 1.3 million have water meters. See the following report.

Carecen 700 mil en DF de medidor de agua

El cobro fijo del agua aplicado por el GDF derivó en reclamos de cientos de vecinos, en particular de la Delegación Benito Juárez.
Foto: Edgar Medel

Ante la lluvia de quejas, el Gobierno del DF aplicará descuentos hasta del 70 por ciento a quienes adquieran el equipo para medir el consumo

Iván Sosa y Manuel Durán

Ciudad de México (26 marzo 2011).- En el Distrito Federal, 700 mil usuarios de agua potable carecen de medidor en sus domicilios.

El Sistema de Aguas de la Ciudad de México (SACM) reporta que de las 2 millones de tomas registradas, sólo 1.3 millones paga en función del consumo.

Al resto se le aplicaban tarifas de entre 200 y 600 pesos al bimestre de acuerdo al promedio de consumo en su colonia o edificio, esquema que se eliminó a finales de 2010.

The Mexico City Water Department has found ways to bill one third of its customers without water meters, so they have found methods which are reliable and are validated by the home owner. The SSC WG needs to adapt its perspective to meet the need of programs in developing and least developed countries. If SSC WG rejects studies, but does allow the "metered option" for faucet fixtures, it still will most likely be excluding developing and least developed countries from the methodology. The responsibility should be on the DOE "that assumptions are made explicitly and choices are substantiated".

$EFF_{Default}$ Comments

The methodology presents two options for calculating certified emission reductions: use of a default energy savings value for water heating energy savings (per showerhead) and a monitoring approach. The SSC WG group states in Annex 2, paragraph 1, that the standard is to require ***"…adequate, reliable and conservative data and methods…***"

Under both options, the methodology approach includes a default water heater efficiency value $EFF_{Default}$ (see formulas 2 and 8, and the definition just before Paragraph 14). This default value is erroneous and does meet the standard of *"…adequate ,reliable and conservative data and methods…*". The efficiency standard should provide the efficiency for tank and flow through water heaters based on data which is reliable and conservative. However, $EFF_{Default}$ is set at 0.80 for fossil fuel-based water heaters without any supporting facts of figures.

In the following paragraphs we provide support set out the facts that using a "new and clean" efficient based on the types of hot water heaters standard for a country or region is conservative and supported by various reputable studies.

(1) A report from the American Council for an Energy Efficient Economy " ACEEE":

Using the more generous metric for efficiency, the average Thermal Efficiency of tank storage water heaters) was 70% when new (degrading to 67%). Instantaneous gas (pass-through) water heaters on the other hand have an average thermal efficiency of 80% when new (degrading to 72%)

They undertook a "...Comparative Study of High-Efficiency Residential Natural Gas Water Heating" and used a metric from DOE, Energy Factor (EF), which takes into account "...both recovery efficiency (the ratio of energy delivered to the water to energy consumed) and standby losses. Needless to say, the EF results in lower overall efficiency. Typically whenever anybody talks about water heater efficiency they only refer to the ration of energy delivered to the water compared to energy input into heater

For the SSC_WG benefit want inform them of the " ACEEE" : The American Council for an Energy-Efficient Economy is a nonprofit, 501(c)(3) organization dedicated to advancing energy efficiency as a means of promoting economic prosperity, energy security, and environmental protection. ACEEE was founded in 1980 by leading researchers in the energy field. Since then we have grown to a staff of more than 35. Projects are carried out by ACEEE staff and collaborators from government, the private sector, research institutions, and other nonprofit organizations. Please see the following reference: http://www.aceee.org/proceedings-paper/ss04/panel11/paper06

(2) In Mexico the regulation hot water heaters is efficiency of the water heater using fossil fuel t 74% tan and 80% for pass through for new and clean. (Majority of the hot water heaters 80% (reference CONAGUA, Mexico's Water Company and Regulatory Authority on Water) are tanked water heater in Mexico). Efficiency established by NOM-003-ENER-2000 and NOM-020-SEDG-2003 "Thermal efficiency for water heaters for residential and commercial use limits, test methods and labeling."

(3) We have 2 separate independent studies which provide comprehensive support that several factors lead to a significant degradation of hot water efficiency from new and clean. The first one is by Battelle Laboratories (http://www.battelle.org/) which shows the dramatic drop in efficiency of hot water heaters do water hardness. (Full Report available at www.flawatertreatment.com/pdfs/Battelle_Final_Report.pdf.)

Table ES-1. Summary of Results for Water Heaters

Water Heater Type	Water Supply	Average Thermal Efficiency, (%)		Equivalent Field Service (Years)	Average Annual Scale Accumulation[1] (grams/year)	Carbon Footprint[2] (kg CO_2/gal hot water)
		Test Start	Test End			
Instantaneous Gas	Unsoftened	80	72[3]	1.6	NA	0.052
	Softened	80	80	1.6	NA	0.050
Gas Storage	Unsoftened	70.4	67.4	2.0	528	0.066
	Softened	70.4	70.4	2.25	7	0.056
Electric Storage	Unsoftened	99.5	99.5	1.25	907	Not Determined
	Softened	99.3	99.3	1.25	14	Not Determined

Notes: [1] The submerged heating element in an electric water heater operates at very high temperatures which results in a high rate of scale buildup in electric water heater when compared to a gas water heater.
[2] Average over 15 years Equivalent Life.
[3] Deliming or Cleaning was performed at this point.

The second report is from R&R, a research group from the University of México. In the report entitled "Loss Factors in Domestic Hot Water Heaters" provide significant detail on factors that degrade the efficiency of hot water heaters. (Report submitted separately.) As stated in the report,

"*The water heaters operation like many other thermal equipments, are associated with presence of losses in efficiency due to different factors, some of them are internal like specific conditions of the heater, but others are external such as the fuel properties and composition*

$EFF_{Default}$ Conclusion

The SSC_WG and the EB should abide by its policy of defining variable by "of ***"adequate reliable and conservative data and methods.*** The fact is that using a "new and clean" efficient based on type of hot water heater standard for a country or region is very conservative and supported by various reputable studies. A very conservative value would be:

$EFFT_{default}$ Efficiency of the fossil fuel-based tank water heater and equal to 0.74
$EFFF_{default}$ Efficiency of the fossil fuel-based flow-through water heater and equal to 0.74

Below are pictures depicting condition of the typical hot water heaters we found in our pilot program: